# FOREST
# RESOURCES
# COMMISSION

## *Background Papers - Volume 4*

*Managing British Columbia's Forest Resources: Structural Alternatives, Financial Considerations and Valuation Estimates*
*- CWC Canadian Western Capital Ltd.*

*Local Employment Impacts of the Forest Industry*
*- Garry Horne and Charlotte Penner (Ministry of Finance and Corporate Relations)*

*The Provincial Economic Impacts of a Supply Reduction in the British Columbia Forest Sector*
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***The views expressed in independent reports prepared for the Forest Resources Commission are those of the authors and not necessarily those of the Commission. They are published in their entirety for the use and interest of the public as background studies to the April 1991 Report of the Commission to the Minister of Forests.***

# MANAGING BRITISH COLUMBIA'S
# FOREST RESOURCES:
# STRUCTURAL ALTERNATIVES,
# FINANCIAL CONSIDERATIONS
# AND
# VALUATION ESTIMATES

*Prepared by*

*CWC Canadian Western Capital Ltd.*

*For The*

*British Columbia Forest Resources Commission*

*January 30, 1991*

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## SECTION I

## EXECUTIVE SUMMARY

### 1. Introduction

The purposes of this report are to:

i) describe the current basic structure of the Ministry of Forests ("MOF");

ii) review the method of managing forests in other jurisdictions;

iii) explore viable corporate, administrative and capital structure alternatives for managing British Columbia's forests;

iv) estimate a range of values for crown forest assets based on a variety of valuation methods; and

v) discuss financial techniques for realizing values potentially available from various corporate, administrative and capital structures.

### 2. Ministry of Forests, British Columbia

The MOF is responsible for all aspects of crown forests including policy formulation, regulation, management, research and information as well as the promotion of forestry on private lands. The MOF formulates an expenditure budget which must be approved by Cabinet annually. Revenues received go directly into the treasury and are not retained in the MOF itself. Silviculture programs and expenditures have been negatively affected due to provincial political and economic changes over the last decade, notwithstanding a widely recognized need to move to a more intensive forest management system.

### 3. Precedent Forest Resources Operating Entities

The five countries reviewed have all undergone, or are currently undergoing, forestry administration structural changes. The changes are generally aimed at giving the commercial forestry activities more autonomy. Most countries have at least separated the accounting of commercial and non-commercial activities. All but Great Britain are looking into the possibility of setting up a forestry crown corporation.

Sweden and New Zealand are the most advanced of these countries with respect to commercial state forest autonomy. Sweden has already created a crown corporation while New Zealand has gone a step further. The New Zealand government has decided that, given the right cutting tenures, private corporations will do the best job of managing the country's forests. The government has divorced itself from the management of state commercial forests by selling long term cutting rights of exotic state plantations to private companies without many reforestation covenants and no substantial ongoing stumpage fees.

## 4. Restructuring Alternatives

Three models for managing the forest resources were considered: the mine, the farm and the utility. It was decided that the mine does not fulfill the Province's goal of a long term high yielding forest resource. The difference between the farm and the utility models lies in the placement of the regulatory body. The regulatory body would exist within the MOF under the farm scenario while it would exist as a stand alone body in the utility scenario.

Two corporate entity alternatives were analyzed: a crown corporation structure and a financing authority structure. The crown corporation entity is recommended as the vehicle for managing the Province's forest resource assets. A financing authority vehicle is usually a single purpose entity used for financial considerations alone, whereas a crown corporation structure can embrace all functional aspects of managing the forests.

Three corporate entity structuring alternatives are discussed: the single entity structure, the parent/subsidiary entity structure and the multiple entity structure. The three structures have certain strengths in common:

i) they allow for the separation of forest resource management and administration from policy creation, regulation and enforcement;

ii) they provide for the opportunity to allow management to focus on management and financial issues;

iii) they allow for clear definition of economic targets; and

iv) they allow for the removal of direct political intervention in the management and administration of British Columbia's forest resource assets.

As you move from a single entity structure to a multiple entity structure, you gain the ability to have local direction and accountability, but you increase the complexity and cost of the overall structure. To minimize initial disruptions and the possibility for transitional problems, it is recommended that the crown corporation should initially adopt a single entity structure. In time, once all of the changes have been absorbed, structural changes could be made that would allow for decentralization, if desired.

The crown corporation's mandate should provide for:

i) the management and administration of the commercial and, if deemed appropriate, a limited range of non-commercial forest resource activities;

ii) financial responsibility and accountability for all commercial activities;

iii) long term value maximization of the Province's forest resource;

iv) the provision and maintenance of a secure supply of timber resources as required for both short term and long term consumption; and

v) the overall development and enhancement of the Province's forest resources.

## 5. Regulatory Structure

Two regulatory models are discussed. The regulatory and enforcement functions could reside within the MOF or they could reside in a stand alone body such as a commission. The commission would report to the MOF and be bound by its policies, but would be a separate body. The mandate of the regulatory body is to ensure the crown monopoly acts to fulfill the MOF's policies in a "fair and reasonable price" environment.

The purposes of separating the regulation and enforcement functions from management and administration of forest lands are to provide a public forum for hearing views about competing uses of forest resources and to increase the degree of financial accountability for forestry operations. Both of these processes can be expected to enhance the value of the forests to British Columbia residents, making the creation of separate regulatory and operating entities a desirable goal.

## 6. Value Estimation

Two approaches are used to estimate the value of the Province's forest resource assets: a current stumpage income valuation approach and a market valuation approach. The objective is not necessarily to identify the absolute range of forest resource values, but rather to:

i) illustrate the variance in forest resource values based on the current income generated from the assets based on current stumpage rates as compared to the potential value of such assets viewed from a market comparable perspective;

ii) provide the rationale for a change in present forest resource management practices; and

iii) create the basis for developing a financial framework for enhancing the Province's realizable value of its forest resource assets.

### Current Stumpage Income Valuation Approach

The current stumpage income valuation approach estimates the underlying value of the assets by discounting the estimated net cash flow generated by the assets over time. The major assumption used for this valuation approach is that MOF revenue and expense figures for fiscal 1990 are sustainable and that silviculture expenditures represent a level which is consistent with long term intensive forest management goals.

Given the long term uncertain nature of the silviculture business, one method of income valuation is to assume that the forestry crown is entirely financed by equity. A second method of income valuation is to assume that the cash flows generated are sufficient to allow for an 80/20 debt to equity capital structure.

**Market Valuation Approach**

The largely closed market tenure system in British Columbia makes it difficult to derive an objective, market driven valuation for crown timber.

Three market mechanisms which offer evidence of at least a degree of competitive pricing formed the foundation of our valuation:

- private sector purchases of crown forest tenures.
- Vancouver Log Market ("VLM") sales.
- Small Business Forest Enterprise Program ("SBFEP") sales under Section 16 of the Forest Act.

Critical assumptions incorporated into the valuation include the following:

- the current allowable annual cut is sustainable for a minimum of 30 years.
- the provincial forest industry infrastructure is not altered.
- the industry's recent historical returns on invested capital represents a desirable long term return target.
- the timber harvested is representative in mix and quality of the remaining stands.

The results of our valuation, as applied under three discount rate scenarios (equity model, leveraged model and inflationary price recapture) are summarized in the table that follows. The VLM valuations for coastal timber did not differ materially from the private sector sales valuation and, as such, are excluded from the table.

## Valuation Summary Estimates
## Net Present Value Ranges

| | Low | Base Case ($Billions) | High |
|---|---|---|---|
| **Current Stumpage Income Valuation Approach** | | | |
| **Equity Model (discount rate @ 13.5%)** | 0.6 | 1.14 | 1.66 |
| **Leveraged Model (discount rate @ 11.44%)** | 0.7 | 1.34 | 1.96 |
| **Market Valuation Approach** | | | |
| **Private Sector Sales Approach** | | | |
| **a) discount rate @ 13.5%** | 2.7 | 4.8 | 6.8 |
| **b) discount rate @ 11.44%** | 3.2 | 5.6 | 8.1 |
| **c) discount rate @ 7.15%** | 5.1 | 9.0 | 12.9 |
| **SBFEP Sales Approach** | | | |
| **a) discount rate @ 13.5%** | | 4.5 | 6.3 |
| **b) discount rate @ 11.44%** | | 5.3 | 7.4 |
| **c) discount rate @ 7.15%** | | 8.5 | 11.9 |
| **Market Valuation Approach Summary** | | | |
| **Valuation Average** | | | |
| **a) discount rate @ 13.5%** | | 4.7 | 6.6 |
| **b) discount rate @ 11.44%** | | 5.5 | 7.8 |
| **c) discount rate @ 7.15%** | | 8.8 | 12.4 |

***Prepared by CWC Canadian Western Capital Ltd.***

## 7. Financial Considerations

Although current stumpage rates do not capture all of the value available from the forest resource, increasing these rates drastically would be met with considerable opposition and could cause significant change in the structure of the forestry industry.

An alternative to immediate stumpage rate increases would be to transition rate increases over time. One means of approaching this transition would be to institute a policy of silviculture debt financing with the debt financing costs funded over time through stumpage rate increases.

## SECTION II

## SCOPE OF REPORT

The terms of reference for this Report are set out in the engagement agreement between the Forest Resources Commission (the "Commission") and CWC Canadian Western Capital Ltd. Pursuant to these terms and in further consultation with the designated personnel from the Commission, this report is focused primarily on the following areas:

i) an overview of the current operational and financial position of the Ministry of Forests, British Columbia;

ii) an overview and update of the 1984 report prepared by Sterling Wood Group Inc., entitled "Alternatives for the Structure and Funding of the B.C. Ministry of Forests and Lands", specifically in respect to precedent corporate entities in operation in other jurisdictions;

iii) a review of alternative corporate and capital structures that would: (a) accommodate the transfer of certain Provincial forestry management and operational functions and assets, and; (b) ensure financial self sufficiency;

iv) examination of the feasibility of establishing a utility-type corporate/capital structure and comment on the possible scope of operations and the requisite regulatory environment; and

v) identification of a range of values for the operations and assets to be transferred to the corporate entity where possible, based on the following valuation perspectives:

    a) as a crown corporation;
    b) private sector sales of forest tenure;
    c) an analysis of the log market sales to provide a proxy for valuation of the forest lands; and
    d) data derived from sales under the terms of the Small Business Forest Enterprise Program.

## SECTION III

## INTRODUCTION

### 1. Background

In September 1990, the Forest Resources Commission (the "Commission") published a study entitled "Options Paper". In this study, the Commission provided the following draft vision statement as the basis of a framework for the future stewardship of the Province of British Columbia's (the "Province") forest lands:

*"The forest resources of British Columbia must provide for the social, spiritual, environmental and economic well being of British Columbians. They must be managed in such a way that these values are maintained for future generations."*

One of the many options identified in the Commission's study, as a means of satisfying the objectives embodied in the draft vision statement, was to restructure the present functions of the Ministry of Forests ("MOF"). The restructuring envisioned under this option was the creation of an independent corporation to manage and administer the forest lands. At the same time, a "Forest Resources Ministry" to set Provincial policy objectives would be created to regulate and enforce the mandate of the independent corporation.

It is beyond the scope of this report to address all of the issues, objectives and impacts of such a major restructuring of provincial forest management. Rather, it is the intent of this report to provide an overview of the major issues warranting change, to identify alternatives and options available to effect the proposed restructuring, and to outline the potential financial consequences of certain key options.

### 2. Underlying Issues

The principal issue facing the Province in the immediate term is how to deal with the growing concerns over the appropriateness of forest resource practices in the Province. Historically, the abundance of the forest resource asset afforded the Province the opportunity to concentrate on extractive forest management practises. The Province used its forest resource as a vehicle for the development of provincial infrastructure, including roads, towns and manufacturing facilities, all of which aided in the creation of employment and economic growth.

The growth of the Province and the demands of the forest industry, combined with the depletion of timber and social, environmental and cultural demands, are at a stage where a refocusing of current forest resource practices is mandatory if major conflicts are to be minimized in the future. In particular, there is the need to balance the full spectrum of public and industry demands on the forest resource while ensuring the replenishment of depleted timber resources necessary to preserve and enhance the Province's principal industry. In essence, there is a need to adopt intensive forest management practices that can more appropriately address and resolve all of these issues.

## 3. Provincial Objectives

The underlying rationale for a restructuring of the management, administration, policy creation, regulation and enforcement functions, presently administered by the MOF, is to establish a framework whereby the following objectives could be satisfied:

i) the refocus of management direction from that of historical extractive practices to that of intensive management practices;

ii) the separation of functions which, given competing demands for limited available resources, could prove to operate at cross purposes to each other;

iii) the establishment of an environment whereby the full spectrum of issues and objectives can be identified, debated and resolved in full recognition by all parties of the cost/benefits of decisions made;

iv) the removal of direct political intervention in the decision making process with the resultant introduction of decision making and resource allocation accountability to those most suited to manage the forest resources; and

v) establishment of a financial and administrative structure to fund forest management, including silviculture, on a self sufficient basis.

## 4. Report Methodology

In order to provide a basis for achieving the objectives listed in the previous paragraphs, the remainder of the report undertakes the following tasks, namely:

i) to describe the current basic structure of the MOF;

ii) to review the method of managing forests in other jurisdictions;

iii) to explore viable corporate, administrative and capital structure alternatives for managing British Columbia's forests;

iv) to estimate a range of values for crown forest assets based on a variety of valuation methods; and

v) to discuss some financial techniques for realizing values potentially available from various corporate, administrative and capital structures.

## SECTION IV

## MINISTRY OF FORESTS AND LANDS

### 1. Legislation

The Ministry of Forests Act (Revised Statutes, 1979) is the Province's major forestry legislation. The Forestry Act gives the MOF wide and penetrating powers. Forest land is vested in the name of the Ministry and may be bought, exchanged or sold.

### 2. Organization

The MOF has three divisions, each headed by an Assistant Deputy Minister:

i) Forestry;

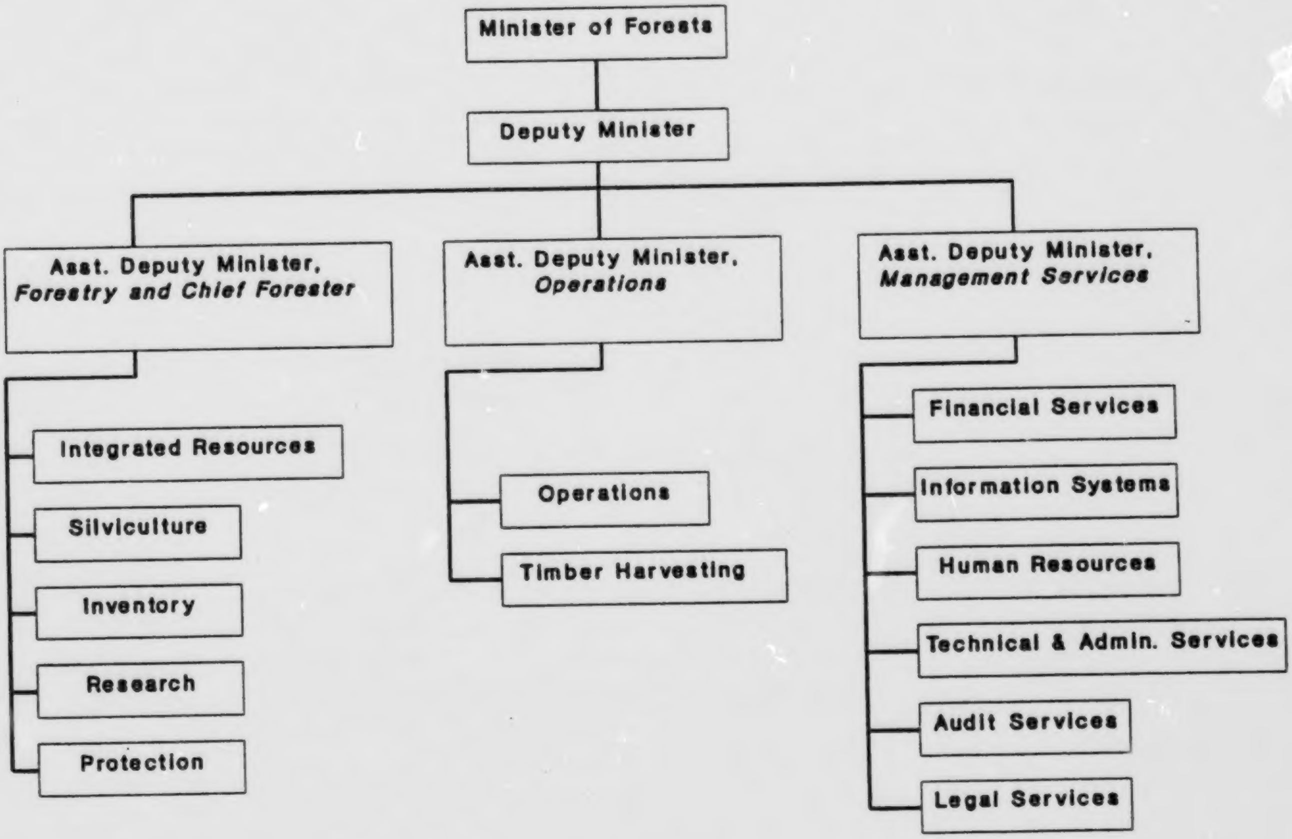
ii) Operations; and

iii) Management Services.

The three Assistant Deputy Ministers report to the Deputy Minister who in turn reports to the Minister of Forests. Each division is broken into functional branches headed by either a Director or an Executive Director. The regional and district offices fall within the Forest and Lands Operations Division. The Province is divided into six forest regions and eight lands regions which is further broken into 43 forest districts.

## 2.1 Organization of Ministry of Forest and Lands

### MINISTRY OF FORESTS ORGANIZATION CHART


Minister of Forests
Deputy Minister
Asst. Deputy Minister, *Forestry and Chief Forester*
Asst. Deputy Minister, *Operations*
Asst. Deputy Minister, *Management Services*
Integrated Resources
Silviculture
Inventory
Research
Protection
Operations
Timber Harvesting
Financial Services
Information Systems
Human Resources
Technical & Admin. Services
Audit Services
Legal Services

## 3. Duties of the MOF

The MOF's stated mission is to manage and protect the Province's forestry range, forest recreation and public land resources for the maximum benefit of all British Columbians. The MOF's mandate is specified in the Ministry of Forests Act which states:

> "a) encourage maximum productivity of the forest and range resources in the Province;
>
> b) manage, protect and conserve the forest and range resources of the Province, having regard to the immediate and long term economic and social benefits they may confer on the Province;
>
> c) plan the use of the forest and range resources of the Province, so that the production of timber and forage, the harvesting of timber, the grazing of livestock and the realization of fisheries, wildlife, water, outdoor recreation and other natural resource values are coordinated and integrated, in consultation and cooperation with other ministries and agencies of the Province and with the private sector;
>
> d) encourage a vigorous, efficient and world competitive timber processing industry in the Province; and
>
> e) assert the financial interest of the Province in its forest and range resources in a systematic and equitable manner."

The MOF is therefore responsible for all aspects of policy formulation, regulation, management of public forests, the promotion of forestry on private lands, research and information gathering and distribution.

## 4. Finance

The MOF formulates an expenditure budget which must be approved by Cabinet annually. Revenues go directly into the treasury and are not held in the MOF itself. Self sufficiency is not required as no distinction is made organizationally or financially between commercial and non-commercial activities.

The following illustrates the financial performance of the MOF over the last ten years along with the budgeted forecast for 1991:

MINISTRY OF FORESTS
STATMENT OF REVENUES AND EXPENDITURES

| | 1990 | 1989 | 1988 | 1987 | 1986 | 1985 |
|---|---|---|---|---|---|---|
| **REVENUE** | | | | | | |
| Stumpage | $458.0 | $393.7 | $420.7 | $214.6 | $166.1 | $144.3 |
| Small business forest enterp | 152.2 | 134.5 | 60.2 | | | |
| Royalty and export | | 62.1 | 26.7 | 13.1 | 17.0 | 14.7 |
| Rents | | 20.9 | 19.1 | 10.0 | 19.1 | 18.6 |
| Interest | | 4.3 | 2.0 | 2.0 | 2.0 | 2.0 |
| Scaling | | 2.8 | 3.9 | 4.2 | 2.5 | 5.4 |
| Range | | 1.6 | 1.3 | | | |
| Other | 100.8 | 3.7 | 2.3 | 2.3 | 2.4 | 2.3 |
| Total Revenue | 711.0 | 623.6 | 536.3 | 246.2 | 209.0 | 187.3 |
| **EXPENDITURES** | | | | | | |
| Minister's office | 0.3 | 0.2 | 0.2 | 0.3 | 0.2 | 0.2 |
| Management services | 93.4 | 47.4 | 52.7 | 13.9 | 13.4 | 11.9 |
| Program administration | 29.4 | 36.6 | 37.5 | 40.0 | 41.8 | 53.3 |
| Harvesting | 55.5 | 42.9 | 87.4 | 91.5 | 79.7 | 73.8 |
| Silviculture | 202.3 | 134.1 | 158.9 | 140.5 | 135.1 | 110.7 |
| Research | 10.5 | 9.5 | 9.6 | 10.1 | 9.4 | 9.0 |
| Forest protection | 16.8 | 19.0 | 25.0 | 26.7 | 25.4 | 21.0 |
| Integrated resource management | 14.7 | 10.7 | 11.0 | 10.0 | 8.7 | 8.4 |
| Inventory | 13.6 | 12.3 | | | | |
| Direct fire fighting | 22.5 | 26.8 | 69.6 | 46.1 | 129.4 | |
| Fire suppression preparedness | 27.5 | 26.4 | | | | 37.6 |
| Development agreement | | 65.5 | 66.1 | 38.8 | | |
| Sub total | 486.5 | 431.4 | 517.9 | 417.9 | 443.0 | 325.8 |
| Forest stand management fund | 5.0 | 2.6 | | | | |
| Small business forest enterprise | 62.9 | 46.5 | | 40.2 | | |
| South Moresby Implementation | 3.4 | 1.0 | | | | |
| Total expenditures | 557.8 | 481.5 | 517.9 | 458.1 | 443.0 | 325.8 |
| Profit | $153.2 | $142.2 | $18.3 | ($211.9) | ($234.0) | ($138.5) |

As can be seen, the MOF has experienced great variability in terms of revenues which has, to a lesser extent, affected expenditure levels.

It should be noted that the stumpage calculation changed in 1987.

## SECTION V

## PRECEDENT FOREST RESOURCES OPERATING ENTITIES

The organization and method of forest administration were examined for five countries whose forestry sector plays an important role in the economy. The countries selected were:

New Zealand
Great Britain
New South Wales (Australia)
Finland
Sweden

The following section briefly summarizes the administrative practices in these countries. Emphasis is placed on the administrative body within each country that is responsible for publicly owned forest lands. This analysis is designed to update the 1984 report entitled "Alternatives for the Structure and Funding of the B.C. Ministry of Forests" with respect to precedent corporate entities operating in other jurisdictions.

### 1. The New Zealand Forestry Sector

### 1.1 Statistics

| | | | |
|---|---|---|---|
| Total land area | 26,900,000 ha | | |
| Total forest area | 7,468,100 ha | = | 28% |
| Total public forest land | 5,235,000 ha | = | 70% |
| Total private forest land | 2,233,100 ha | = | 30% |
| Public indigenous forest | 4,904,800 ha | = | 79% |
| Private indigenous forest | 1,323,400 ha | = | 21% |
| Public exotic forest | 330,200 ha | = | 27% |
| Private exotic forest | 909,700 ha | = | 73% |
| Total roundwood removals (3/90) | 11,871,000 m3 | | |
| Indigenous roundwood removals (3/90) | 360,000 m3 | = | 3% |
| Exotic roundwood removals (3/90) | 11,511,000 m3 | = | 97% |

### 1.2 Legislation and Other Developments

The main body of legislation governing forest management in New Zealand is the Forest Act of 1949, which gives the New Zealand Forest Service, under the Minister of Forests, exclusive responsibility for carrying out all matters of forest policy affecting state forest lands. Several other Acts are also pertinent to the forest resource and the Forest Service is additionally responsible for administering these statutes. Other Acts include wild animal control, import standards, forestry encouragement grants, etc..

In recent years significant legislative and organizational changes have taken place. By 1987 it had become apparent that the performance of the New Zealand Forest Service ("NZFS") had become impeded by a multiplicity of commercial, non-commercial and conservation goals. On April 1, 1987 three new government agencies took over the roles and functions of the NZFS.

### 1.2.1 The Ministry of Forestry

The Forest Act 1949 and subsequent amendments to that Act (the 1987 amendment in particular) sets out the powers and responsibilities of the Minister of Forestry and the Secretary of Forestry.

The Ministry of Forestry's mission is to promote national interest through forestry and wood-based industries. The Ministry is mainly a policy body but it is also in control of forestry research.

### 1.2.2 The Department of Conservation

The Department of Conservation is governed by the Conservation Act 1987. The Department of Conservation is entrusted with the management of those parts of the crown estate that are protected for their natural, scientific, historic, cultural or recreational values; this includes New Zealand's indigenous forest resource.

### 1.2.3 The New Zealand Forestry Corporation Ltd. ("NZFC")

The NZFC took over the commercial responsibilities of the NZFS. The governing Act was the State-Owned Enterprises Act 1986. The rights to all exotic crown plantation forests were transferred into the NZFC.

Since 1987 further significant developments have occurred. The sale of more than half a million hectares of crown plantation forest was announced in 1988 and officially launched by the NZFC on October 25, 1989. Tenders were called in April and closed on July 4, 1990. To date, 228,472 hectares of forest and the Conical Hill sawmill have been sold for $971 million. The management and transfer of the crown's forests assets is governed by the Crown Forest Assets Act 1989.

The NZFC ceased to exist in its original form on November 30, 1990. Three new State-owned enterprises were established in its place: Timberlands (West Coast) Ltd., Forestry Corporation of New Zealand Ltd. (responsible for the Bay of Plenty forests), and New Zealand Timberlands Ltd. These crown corporations hold the timber rights not yet sold by the NZFC. Timberlands (West Coast) Ltd. and New Zealand Timberlands Ltd. hold small parcels of land that are thought to be somewhat difficult to cut. The Forestry Corporation of New Zealand Ltd. is the subject of a dispute with Fletcher Challenge and accordingly has not been sold accordingly. These companies are governed by the State-Owned Enterprises Act.

The Treasury is charged with the responsibility of selling unsold crown forest assets. The Department of Survey and Land Information has been given responsibility for administering Crown Forestry Licenses.

The New Zealand government has signalled two further changes affecting forestry: a Forest Policy for New Zealand, and an Indigenous Forest Policy.

### 1. A Forest Policy for New Zealand

A number of factors have underlined the need for a long-term philosophy of forest management in New Zealand: unlike many European countries New Zealand has no commonly endorsed philosophy, and over recent years there have been significant changes in both indigenous and plantation forest management in the country.

A public discussion paper on a Forest Policy for New Zealand was launched by the Ministry of Forestry on September 19, 1990 and there was a call for submissions. The discussion paper identified thirteen desired outcomes and associated implementation mechanisms which can be achieved through trees and forests. The outcomes are:

1. Increased public awareness of the values of trees and forests both in New Zealand and overseas.
2. A framework for the protection and sustainable management of forests and forest lands of all tenures.
3. Local, regional and central government assistance and finance for protection, planting, and management of trees and forests where the market fails to meet socially desirable goals.
4. Appropriate mechanisms to protect trees and forests from fire, pests and pathogens.
5. Research, training, and education to protect and improve forest values and enhance capabilities in forestry.
6. Protection of water and soil values.
7. Protection of natural biodiversity.
8. Appropriate design, planting and management of trees and forests.

9. Increased employment, national and regional development, added value earnings, and diversification of the New Zealand economy.

10. Recognition of the rights and responsibilities of landowners, opportunities for landowners to participate in the management of leased land, and appropriate roles for the community in forestry related land-use planning.

11. Enhanced recreational access to forests.

12. Recognition of the role of trees and forests in mitigating $CO_2$ levels.

13. An effective New Zealand contribution to the solution of forestry issues of global significance.

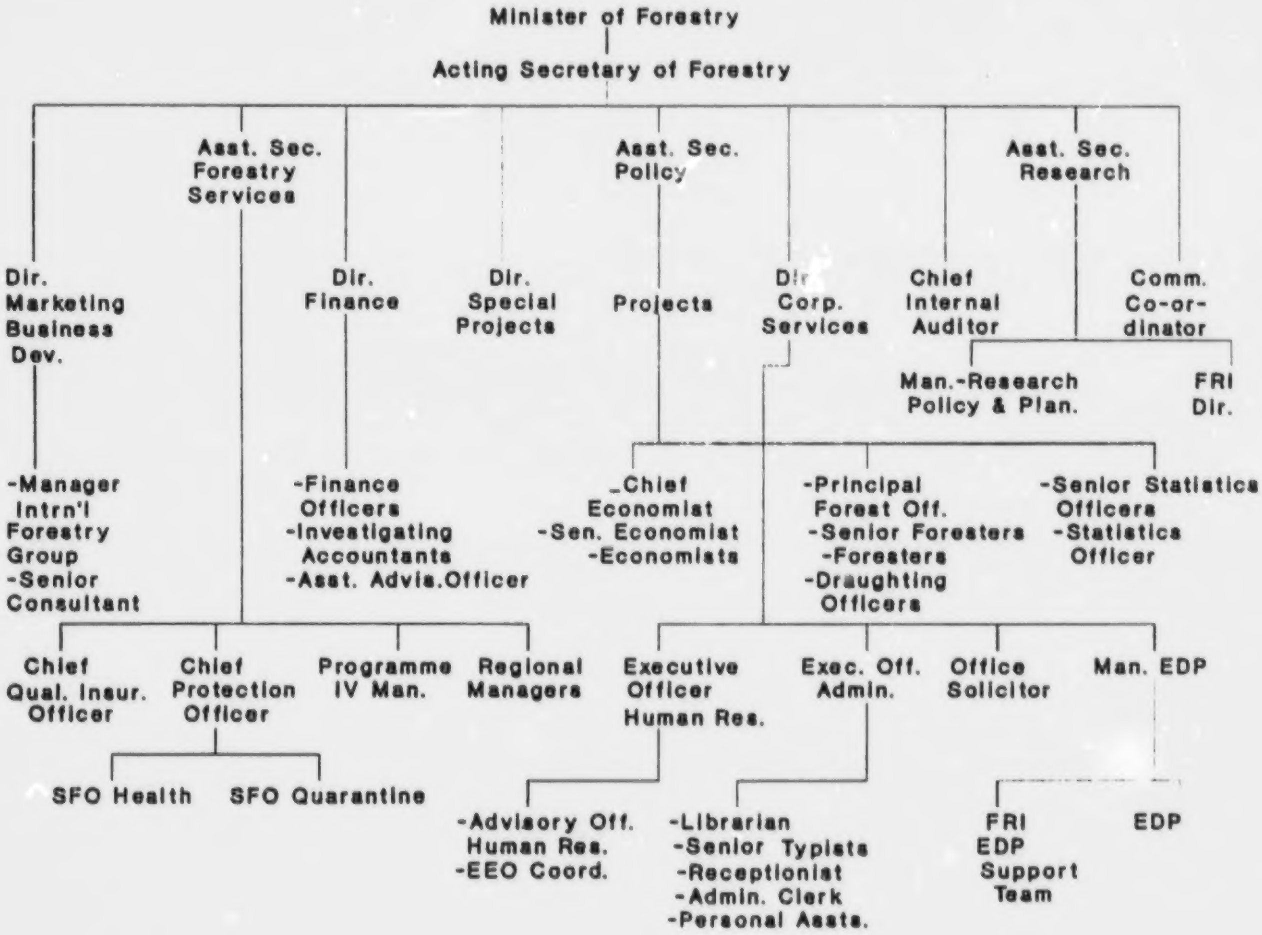
There are a number of potential implementation mechanisms including education, public persuasion, voluntary codes of practice and a revision of the Forests Act 1949. Different implementation mechanisms will be appropriate for different elements.

## 2. A National Policy for Indigenous Forests

Following the release of a discussion paper and wide ranging consultation, the previous Labour government introduced an indigenous forest policy covering public and private land in 1990. Its objective is to maintain or enhance, in perpetuity, the current area of indigenous forest, either by protection, sustainable management, or reafforestation of indigenous species. The indigenous forests fall under the jurisdiction of the Department of Conservation. The current National government have indicated a desire to revisit the policy before any indigenous forests legislation is enacted.

## 1.3 Organization of the Ministry of Forestry

NEW ZEALAND- ORGANIZATION


Minister of Forestry
Acting Secretary of Forestry
Asst. Sec. Forestry Services
Asst. Sec. Policy
Asst. Sec. Research
Dir. Marketing Business Dev.
Dir. Finance
Dir. Special Projects
Projects
Dir. Corp. Services
Chief Internal Auditor
Comm. Co-or-dinator
Man.-Research Policy & Plan.
FRI Dir.
-Manager Intrn'l Forestry Group -Senior Consultant
-Finance Officers -Investigating Accountants -Asst. Advis.Officer
-Chief Economist -Sen. Economist -Economists
-Principal Forest Off. -Senior Foresters -Foresters -Draughting Officers
-Senior Statistics Officers -Statistics Officer
Chief Qual. Insur. Officer
Chief Protection Officer
Programme IV Man.
Regional Managers
Executive Officer Human Res.
Exec. Off. Admin.
Office Solicitor
Man. EDP
SFO Health
SFO Quarantine
-Advisory Off. Human Res. -EEO Coord.
-Librarian -Senior Typists -Receptionist -Admin. Clerk -Personal Assts.
FRI EDP Support Team
EDP

*Prepared by CWC Canadian Western Capital Ltd.*

The position and powers, including that of delegation, of the Secretary of Forestry are provided for and defined in the Forest Act 1949 as amended. The Ministry is organized in a similar manner to the British Columbia Ministry of Forests and Lands.

## 1.4 Responsibility of the Ministry of Forestry

The Ministry of Forestry's mission is to promote national interest through forestry and wood-based industries. In achieving its mission it contributes to the outcomes of the government by the provision of:

- policy advice to the government on issues regarding forestry and its contribution to the national economy;
- more than 80% of forestry and related research and technology in New Zealand through the Forest Research Institute. The National government has indicated in its election manifesto its intention to create stand-alone research institutes. The intent is to ultimately have a self financing research facility used by both government departments and corporations.
- forestry information, advisory and regulatory services to the forestry sector, government and public; and
- administration for the government's financial and forestry contractual commitments, including the residual; activities of the NZFS, Maori lease forests, Forestry Encouragement Grants and Loans and compensation for the failed alkyl ammonium compound (AAC) treated timber.

The Ministry has withdrawn from its role of providing a domestic commercial consultancy service and has established an information and advisory service as a new output.

## 1.5 Finance

The large scale sale of timber rights has generated funds which went into the general government treasury. Once the unsold assets are sold, a crown corporation will not exist. Private corporations are responsible for their own reforestation costs.

Ministry of Forest expenditures will be funded from the government treasury after annual budget appropriations. It is anticipated that, in time, research facilities will be self financing.

## 1.6 Notes

As part of the previous governments' privatization initiatives, the old New Zealand Forest Service has been drastically changed. The premise of the new policy is that given a long term contract, private industry will act in the best interest of maintaining a perpetually high yielding exotic forest. Therefore, the timber tenures were extended and relieved of many complicated covenants. There are no covenants to force private corporations to maintain a minimum reforestation program after clear cutting. This has been done for three reasons. Firstly, it is assumed that private companies will want to keep up the value of their tenures. This fact is backed up by a favourable history of private corporation reforestation policies. Secondly, it was felt that putting a long list of covenants on the tenure contracts would decrease the sale value unnecessarily. Thirdly, verification of compliance was felt to be too difficult and inaccurate.

The Ministry of Forests is left, therefore, as mainly a policy making and information producing body. There have been discussions of merging the Ministry of Forests with other Ministries, such as the Ministry of Agriculture, however, it does not appear that this will happen in the near future.

Indigenous forests, recreation, parks, etc. have all been moved to the Department of Conservation where they can be handled as governmental policy, not as commercial issues.

It should be noted that a new government was voted in November 1990 and all Forestry policies and issues are currently under review.

## 2. Great Britain

### 2.1 Statistics

| | | | |
|---|---|---|---|
| Total land area | 22,987,000 ha | | |
| Total forest land area | 2,327,000 ha | = | 10% |
| Public forest land area | 899,000 ha | = | 39% |
| Private forest land area | 1,428,000 ha | = | 61% |
| Annual cut from public land (1989) | 3.60 million m3 | = | 54% |
| Annual cut from private land (1989) | 3.03 million m3 | = | 46% |
| Approximate annual consumption | 50.00 million m3 | | |

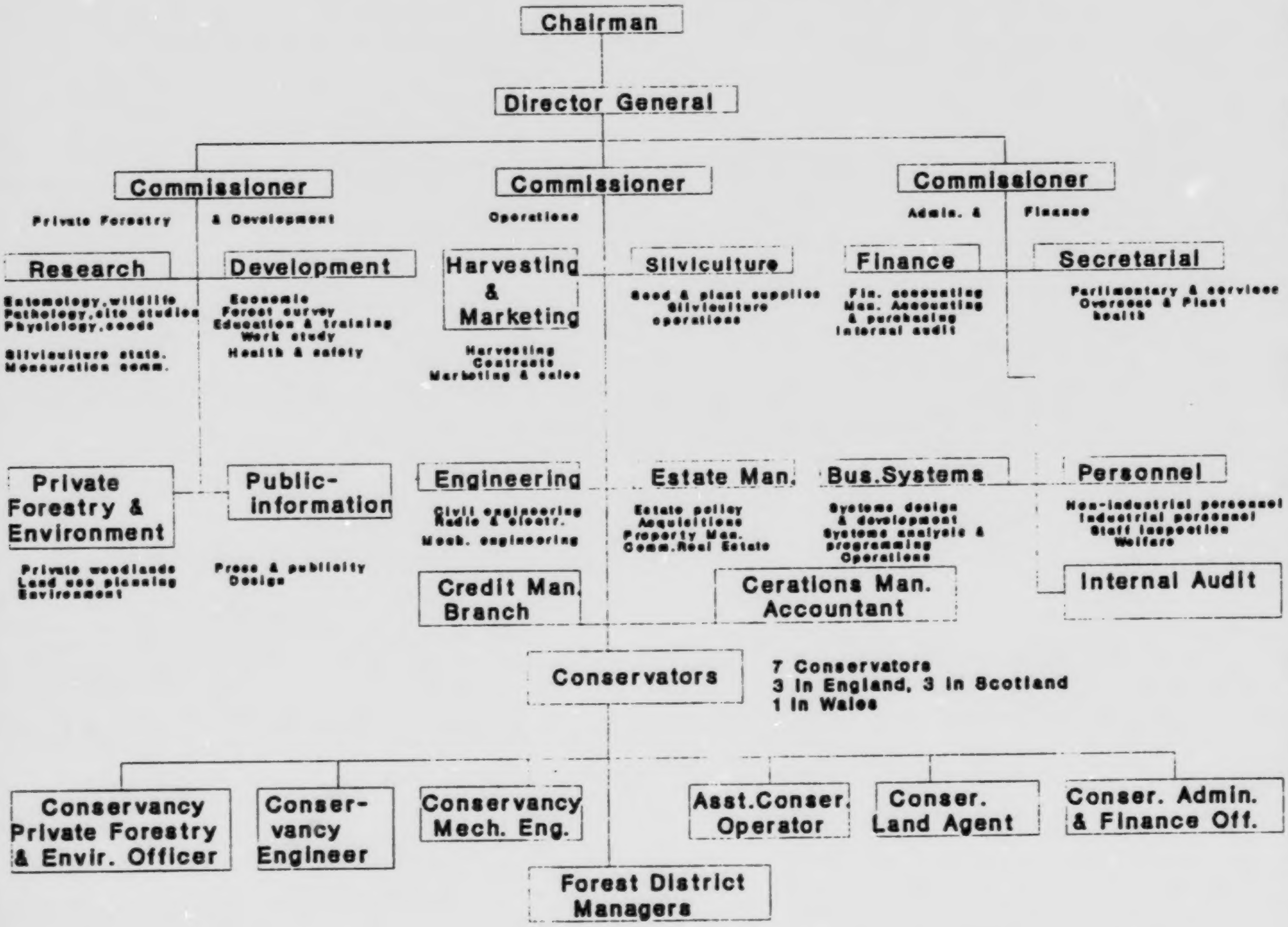
### 2.2 Legislation

The Forestry Act was passed by Parliament in 1919 which created the British Forestry Commission. The Commission was charged with the task of ensuring that Great Britain was not totally reliant on imported lumber. The government recognized that the Commission would be most effective if it was somewhat insulated from party politics and undue bureaucratic interference, while still being accountable and generally responsive to the economic realities of the national economy. Amendments to the Act have been made periodically, the most recent having been in 1986 empowering the Commissions to require the restocking of private lands with trees after unauthorized felling.

The existing Forestry Acts give the Forestry Commission wide and penetrating powers. The Commission is charged with the general duty of promoting the interests of forestry, the development of afforestation and the production and supply of timber and other forest products in Great Britain. In exercising these functions under the Forestry Acts, the Commission is to seek a reasonable balance between forestry and conservation. Forest land is vested in the name of the relevant Forestry Minister and placed at the disposal of the Commissioners. Within its budget, the Commission may carry out harvesting, thinning, planting or silviculture activities on its land. The Commission also has a degree of control over private-sector forestry activities and is empowered to prevent the felling of trees on any private land. Most control over private lands, however, is through the administration of grant-aid programs.

## 2.3 Organization of the Forestry Commission

### THE ORGANIZATION OF THE BRITISH FORESTRY COMMISSION


Chairman
Director General
Commissioner
Private Forestry & Development
Commissioner
Operations
Commissioner
Admin. & Finance
Research
Entomology, wildlife
Pathology, site studies
Physiology, seeds
Silviculture stats.
Mensuration comm.
Development
Economic
Forest survey
Education & training
Work study
Health & safety
Harvesting & Marketing
Harvesting
Contracts
Marketing & sales
Silviculture
Seed & plant supplies
Silviculture operations
Finance
Fin. accounting
Man. Accounting
& purchasing
Internal audit
Secretarial
Parlimentary & services
Overseas & Plant health
Private Forestry & Environment
Private woodlands
Land use planning
Environment
Public-information
Press & publicity
Design
Engineering
Civil engineering
Radio & electr.
Mech. engineering
Estate Man.
Estate policy
Acquisitions
Property Man.
Comm.Real Estate
Bus.Systems
Systems design
& development
Systems analysis &
programming
Operations
Personnel
Non-industrial personnel
Industrial personnel
Staff inspection
Welfare
Credit Man. Branch
Cerations Man. Accountant
Internal Audit
Conservators
7 Conservators
3 in England, 3 in Scotland
1 in Wales
Conservancy Private Forestry & Envir. Officer
Conser-vancy Engineer
Conservancy Mech. Eng.
Asst.Conser. Operator
Conser. Land Agent
Conser. Admin. & Finance Off.
Forest District Managers

*Prepared by CWC Canadian Western Capital Ltd.*

The Forestry Commission is headed by a Board consisting of eleven Commissioners appointed by the Queen and answerable to the government. Three Ministers are responsible for the Forestry Commission: the Secretary of State for Scotland, the Secretary of State for Wales and the British Minister of Agriculture, Fisheries and Food.

Two main Statutory Committees assist the Commission, one at the head office level and one at the regional level. The Commission headquarters are in Edinburgh, Scotland and the operations are divided into 7 conservancies. Each conservancy is made up of several forest districts (57 in all).

The Forestry Commission acts both as the Forestry Authority and the Forestry Enterprise. As the Forestry Authority, the Commission acts as an advisor on government forestry policy and undertakes functions such as research, technical advice, plant health, the control of tree felling and the administration of grant-aid for the private sector. As the Forestry Enterprise, the Commission acts as a trading body primarily responsible for the management of its own forests, however, it also serves other functions such as the protection and enhancement of the environment and the provision of recreational facilities.

The accounts of the Forestry Authority and the Forestry Enterprise are separate while both functions are served by the same personnel.

## 2.4 General Duties of the Forestry Commission

In the past, the general objective of the Forestry Commission was to build up an adequate supply of domestic timber. Even though most forests are still relatively immature, the Commission is now in a position to begin harvesting wood from the forests that its policies have helped to create. The new emphasis has shifted to maximize self sufficiency through wise management of its forest and land wealth while including the management of its timber resource to realize multiple uses. Self sufficiency is a goal that will not be met in the near future either fiscally or in terms of timber requirements.

The Commission has always borne the responsibilities of managing its own lands from afforestation through to harvesting and restocking. Since 1981 the Commission has been empowered to dispose of some of its land and plantations in response to the government's request for the private sector to take on an increased share of the forestry industry initiatives. The current program, started in 1989, requires some 100,000 hectares of government owned forests to be sold by the end of the century. This enables the Commission to dispose of parcels of land that are too cumbersome to manage publicly but might be economical in the private sector.

One of the primary tasks of the Forestry Authority is the administration of private sector planting. As a matter of government policy, the bulk of new planting is now undertaken by the private sector with the help of grant-aid from the Commission.

## 2.5 Finance

All funds received by the Forestry Commission are put into the Forestry Fund. An annual budget is approved by Parliament and the amount required (the Grant-In-Aid) is put into the Forestry Fund by the Treasury. Proceeds from the sale of timber, sporting licences, commercial recreation, etc. are also paid into the Forestry Fund, however, all proceeds from the sale of forest land must by law be surrendered to the Treasury.

Although the Forestry Authority and Forestry Enterprise have separate accounts, both use the Forestry Fund and neither is self financing at this time. It is not anticipated that the Forestry Enterprise will be self financing in the near future due to the relative immaturity of the forests and the requirement to plant trees in areas that are not commercially viable but are desirable for other reasons.

A fundamental policy change in 1988 saw the abolition of tax reliefs for private sector planting. As a matter of government policy, the Commission now only has a small new planting program (approximately 4,000 hectares per year) which is mostly confined to the poorer, more remote areas where other social benefits will occur as well. This has resulted in, for the moment at least, a drop in planting by the private sector as it adjusts to a grants-only regime currently in place.

## 2.6 Notes

The Commission has been under considerable pressure from environmental groups to split the Forest Authority and the Forest Enterprise completely. The environmentalists state that most time, effort and money is spent on Enterprise activities and those working on Authority matters do so with the effect on Enterprise in mind. A Commission funded consulting group recommended in February 1990 that the two functions be split entirely. However, the current Commission position is that no split will occur in the near future. The topic is currently the cause of much discussion. The main arguments against splitting the two departments centre on the fact that both departments are relatively small compared to other governmental departments. If the split occurred, total costs would rise and the experiences gained in one department would not fully flow to the other department, as it should. Proponents of the split argue that Enterprise could be freed of the non-commercial and general budget constraints of the government and could flourish, in time, on its own. As stated earlier, environmentalists feel that by splitting the two departments, there would be a true independent voice of conservation within the Forestry Commission.

## 3. New South Wales (Australia)

### 3.1 Statistics

| | |
|---|---|
| Total forest area/total land area | 19% |
| Native forest production | 60% |
| Plantation forest production | 40% |
| Breakdown of State Owned Lands | |
| - Native | 89% |
| - Plantation | 5% |
| - Not forested | 6% |
| 1990 Pulpwood Production | |
| - from public lands | 68% |
| - from private lands | 32% |
| 1990 Sawlog Production | |
| - from public lands | 80% |
| - from private lands | 20% |

### 3.2 The Forest Resource

New South Wales ("NSW") is gradually progressing through a transition from forestry based on native forest types to plantation management of Radiata pine, Hoop and Bunya pine, and Eucalyptus. Only a very small proportion of the total forest land has been converted to plantations and plantations are now being established on substantially cleared land, not on cleared native forest. Land is being purchased at about 5,000 ha per year for plantation use. Within the indigenous resource there are five major types, but only the coastal hardwoods are of commercial significance. The indigenous forests forms the largest single component and makes up more than 25% of the total forest area.

Public ownership of forest land is the predominant pattern.

### 3.3 Legislation

The NSW Forestry Act of 1916 established a Forestry Commission to administer all State Forests in the best public interest. The Act provides the Commission with wide powers to conduct its business and to buy, hold, lease, and sell land. It makes the Forestry Commission responsible for managing and protecting the State forests for multiple use, establishing plantations of exotic species and undertaking research and providing services to government, industry and the public.

Legislation in 1981 extended the powers of the Commission to enter into commercial activities, form companies, raise loans, and enter into agreements for the control and silvicultural management of privately owned lands.

Some minor changes have also occurred such as an amendment in 1989 which changes the compensation to lessees of certain crown leases, owners of purchase tenure land and the Pastures Protection Board in control of land. The compensation changes are to occur where the Commission either removes forest materials from the land or issues licences to remove forest materials from the land to persons other than the relevant lessee, owner or Pastures Protection Board.

### 3.4 Organization of the NSW Forestry Commission

Under the Forestry Act the Forestry Commission is subject in all respects to the control and direction of the Minister responsible. The Forestry Commission is headed by the Commissioner for Forests with two Assistant Commissioners all appointed by the Governor for terms not exceeding seven years.

The Commission has a decentralized management structure which reflects the nature of its operations and allows the optimal use of resources in carrying out its functions efficiently and effectively. It has a head office, regional offices and district offices, some of which have research centres, mechanical workshops and tree nurseries under their control. Within the head office there are six divisions to administer particular duties. Away from the head office in Sydney there are nine regional offices, each of which has a staff that controls district offices (47), nurseries (8), workshops (18), research centres (5), selling centres (4) and a central bulk store.

### 3.5 Objectives of the Forestry Commission

The Forestry Act of 1916 and the Amendment of 1981 make the Forestry Commission responsible to conserve and utilize all state forests and timber reserves to the best advantage of the state. This includes multiple use, marketing the forest products from crown timber land, establishing plantations, undertaking research, providing services and advice as well as to preserve and improve the soil reserves water catchment capabilities, and other environmental enhancement activities.

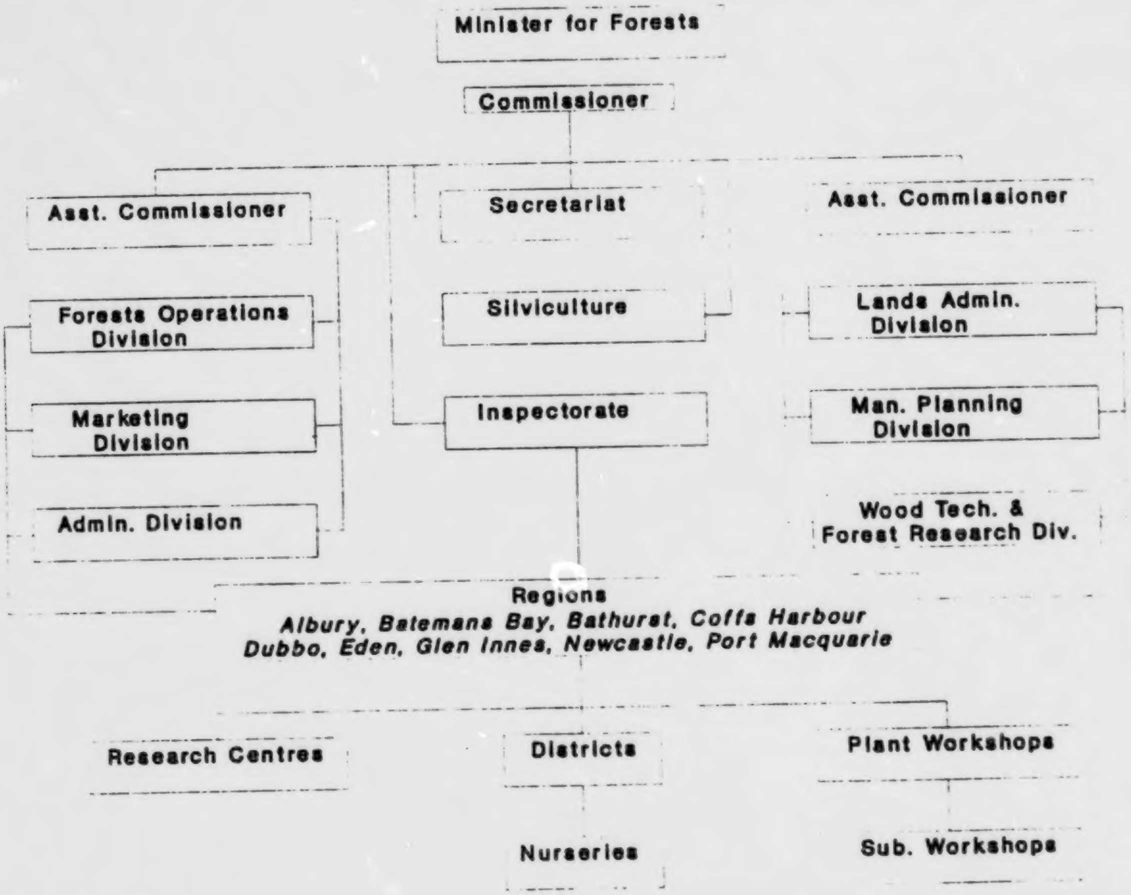
The Forestry Commission also administers and encourages the production and use of timber derived from private lands through wood lot loan schemes and other programs.

### 3.6 Finance

Since the 1988-89 financial year the Forestry Commission has moved from the inner to the outer state government budget sector which is intended to take the department a step away from general government financial control. The Commission now retains all its earnings and is required to be self-funding for its commercial activities. It paid its first dividend to State Treasury this year. So far $6 million has been paid of a total dividend to be paid of $10 million.

## 3.7 Organization of New South Wales ("NSW")

ORGANIZATION OF THE FOREST
COMMISSION OF NEW SOUTH WALES


Minister for Forests
Commissioner
Asst. Commissioner
Secretariat
Asst. Commissioner
Forests Operations Division
Silviculture
Lands Admin. Division
Marketing Division
Inspectorate
Man. Planning Division
Admin. Division
Wood Tech. & Forest Research Div.
Regions
Albury, Batemans Bay, Bathurst, Coffs Harbour
Dubbo, Eden, Glen Innes, Newcastle, Port Macquarie
Research Centres
Districts
Plant Workshops
Nurseries
Sub. Workshops

The Forestry Commission's accounting systems now separate commercial and non-commercial ("functions of government") activities. The latter are funded from consolidated revenue by the state government.

The government has recently set up a working party (on which the Forestry Commission is represented) to investigate the feasibility of making the commission a separate crown corporation.

### 3.8 Notes

Emphasis is being placed on firmly establishing plantations of exotic species to provide the wood supply required to build a healthy, substantial industry in NSW.

The NSW Forestry Commission has operated in many respects in a manner similar to that of a private corporation. As the commission's budget has been moved to the outer state government budget sector, it is clear that the intent is to make the commission a separate financial entity. The working party to investigate the feasibility of making the commission a crown corporation is expected to make a recommendation to the government in the first half of 1991.

Discussion has mainly centred on what should be and what should not be included in a crown corporation. Environmental groups have been lobbying hard to stop rainforest logging and have won that battle. Now environmental interests have turned to old growth logging. Exotic plantation of substantially cleared land is not seen as a problem to include in the crown, however, a fight is expected in including certain indigenous forests. Environmentalists fear that by separating the "commercial" and "non-commercial" activities, the crown will act without regard for environmental issues.

## 4. Finland

### 4.1 Statistics

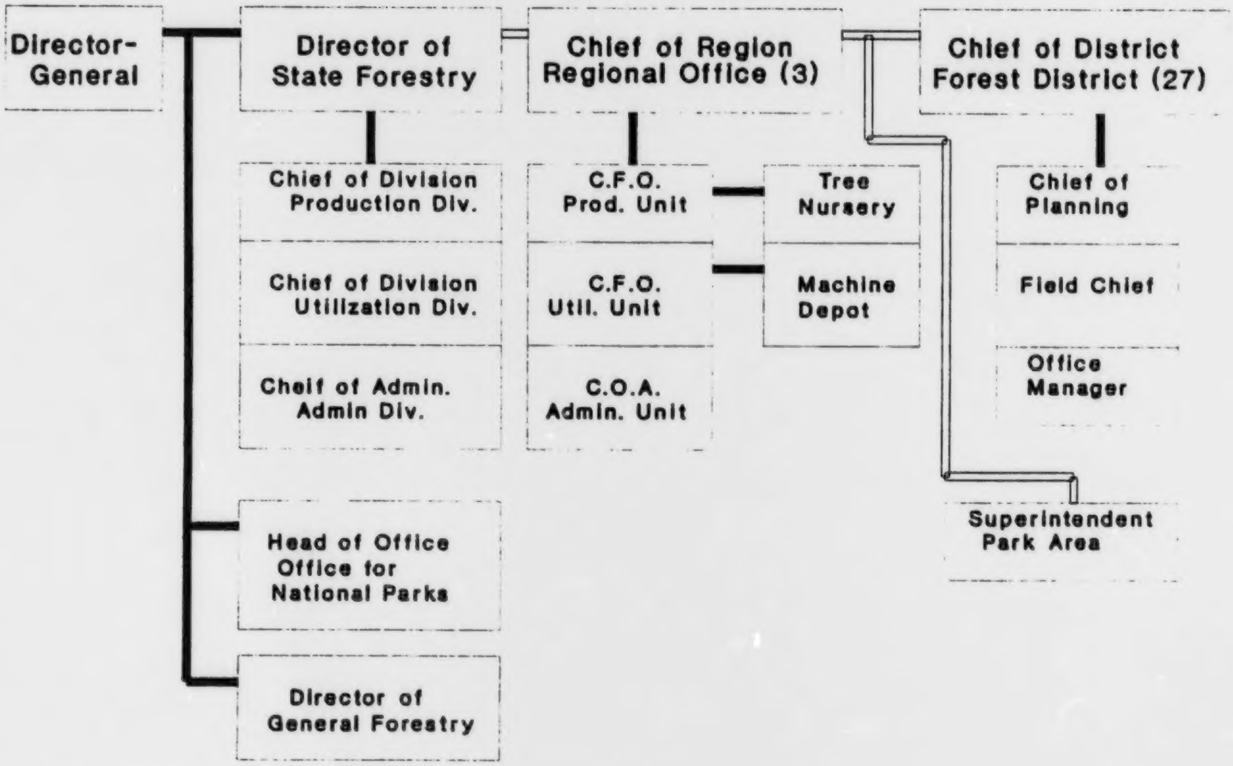
| | | | |
|---|---|---|---|
| Total land area | 30,500,000 ha | | |
| Total forest area | 20,065,000 ha | = | 66% |
| Public forest land | 4,755,000 ha | = | 25% |
| Private forest land | 14,415,000 ha | = | 75% |
| Annual allowable cut | 68.4 million m3 | | |
| Recent harvest levels | 58.7 million m3 | = | 85% |
| Approximate annual requirements | 51.7 million m3 | | |

## 4.2 Legislation

Five major Forestry acts define the duties of Finland's National Board of Forestry ("NBF"). These acts encompass Forest Administration, Private Forests, Forest Improvements, Forestry Boards and Forestry Associations. Most of the original acts were written in 1967 while substantial changes were put in place on March 1, 1987. The new legislation moves forestry policy responsibilities, the general supervision of the implementation of the Forest Improvement Act and some matters pertaining to the administration of private forests out of the NBF and into the Ministry of Agriculture and Forestry. In effect, the Ministry had been acting as if it had responsibility for forestry policy anyway. New changes are expected in 1991 which include, among other things, shifting all responsibility for the private forest sector to the Ministry.

## 4.3 Organization of the NBF

ADMINISTRATION
OF FINNISH STATE FORESTS


Director-General
Director of State Forestry
Chief of Region Regional Office (3)
Chief of District Forest District (27)
Chief of Division Production Div.
Chief of Division Utilization Div.
Cheif of Admin. Admin Div.
C.F.O. Prod. Unit
C.F.O. Util. Unit
C.O.A. Admin. Unit
Tree Nursery
Machine Depot
Chief of Planning
Field Chief
Office Manager
Superintendent Park Area
Head of Office Office for National Parks
Director of General Forestry

C.F.O.= Chief Forest Officer; C.O.A. = Chief of Admin.

*Prepared by CWC Canadian Western Capital Ltd.*

The NBF has a relatively simple organizational structure similar to any large corporation.

Two functional divisions exist, the forestry production division and the forestry utilization division. District level managers report to regional managers which inturn report to the Director of State Forestry. The director of State Forestry reports to the Director-General which reports to a board of directors appointed by the Ministry of Agriculture and Forestry.

Organizational changes are expected to occur in 1991 but it is unclear as to what those may be. The direction of changes has, in the past, been to move the NBF to a more autonomous body and to give the local boards more responsibilities. There have been ongoing discussions of turning the NBF into a crown utility.

### 4.4 General Duties of the NBF

The duties as defined in the Forest Administration Act are to manage, utilize and protect government forests under its administration. This includes increasing yields, rehabilitating low or non-productive land by cultivation as well as the preservation of lands for multiple use activities.

### 4.5 Finance

The NBF is a government central agency and as such is financed directly from the government budget through approved annual budgets from the Ministry of Agriculture and Forestry. All revenues are collected directly by the State Treasury. The government has recognized the need for more intensive forestry management and has stated in the Forest Improvement Act that adequate appropriations for forest improvements should be provided. However, political and economic events have allowed the amount of available funds to fluctuate in such a way as to affect the programs' activities.

As mentioned earlier, there has been considerable discussions on whether or not the NBF should be a public utility. Changes are expected in 1991 that would move the NBF in that direction.

### 4.6 Notes

Recognizing the importance of the forestry sector to Finland's economy, the government is beginning to make changes to the organization of the NBF to give it more autonomy. Many of the changes seem to be moving the NBF's structure more towards that of Sweden's National Forest Enterprise. Substantive changes are expected in 1991.

## 5. Sweden

### 5.1 Statistics

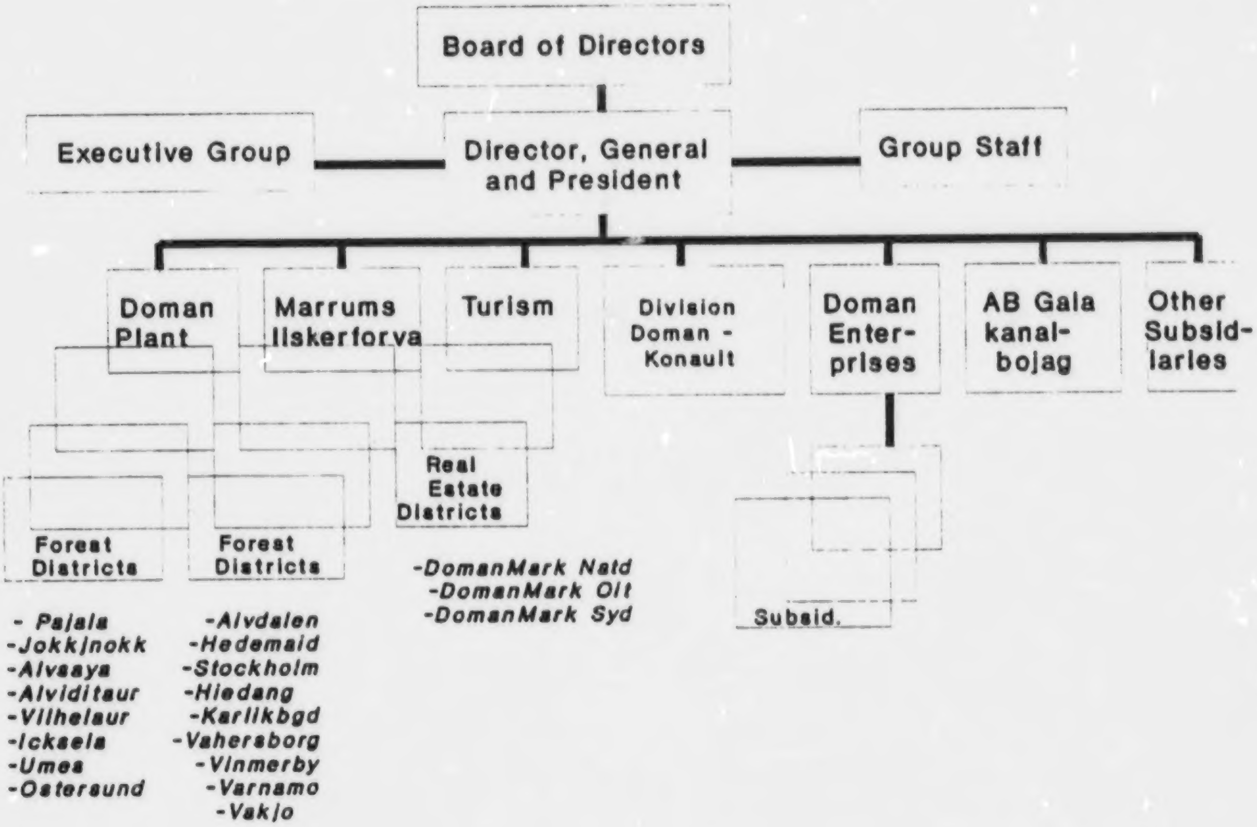
| | | | |
|---|---|---|---|
| Total land area | 41,141,000 ha | | |
| Total forest land area | 23,700,000 ha | = | 58% |
| Public forest land area | 6,213,000 ha | = | 26% |
| Private forest land area | | | |
| - companies | 5,925,000 ha | = | 25% |
| - private citizens | 11,562,000 ha | = | 49% |

### 5.2 Legislation

The Swedish Forestry Act is the country's major forestry legislation. The Act stipulates that the government is to use the land's wood-growing capacity properly and to manage the forests in such a way as to provide a perpetual high value timber yield, but with great deference paid to environmental protection and to the multiple use of forests. The Act applies to both public and private wood lands.

The chief responsibility for forest policy is vested in the Ministry of Agriculture whereas the practical application of forest policy rests with the National Board of Forestry for private lands and with the National Forest Enterprise for public lands. The National Board of Forestry is an agency within the Ministry of Agriculture while the National Forest Enterprise operates under the Ministry of Industry.

## 5.3 Organization of the National Forest Enterprise ("NFE")



SWEDEN - ORGANIZATION

Board of Directors
Executive Group
Director, General and President
Group Staff
Doman Plant
Marrums Iiskerforva
Turism
Division Doman - Konault
Doman Enter-prises
AB Gala kanal-bojag
Other Subsid-iaries
Forest Districts
Forest Districts
Real Estate Districts
Subsid.
- Pajala
-Jokkjnokk
-Alvsaya
-Alviditaur
-Vilhelaur
-Icksela
-Umea
-Ostersund
-Alvdalen
-Hedemaid
-Stockholm
-Hiedang
-Karlikbgd
-Vahersborg
-Vinmerby
-Varnamo
-Vakjo
-DomanMark Natd
-DomanMark Olt
-DomanMark Syd

The National Forest Enterprise of Sweden, together with its subsidiaries, make up a crown corporation called Domän. The company is a profit seeking firm with branches in forestry, wood processing, housing, consulting services, forestry equipment, farming, gravel and concrete, leisure and tourism and hunting and fishing. The company is set up in a classic corporate structure including a board of directors whose members are not all government employees.

The director general and president has an executive group and a group staff to help direct the operations. The company is divided into business units depending on business type. Within the units, division is based on location.

A new organizational structure is expected to be unveiled within a month. It is not presently known what the changes will be.

## 5.4 General Duties of the National Forest Enterprise

The National Forest Enterprise is to administer the state's forest and farmland holdings to achieve maximum long term benefit to Sweden. Its work is to be carried out on a strictly businesslike basis with the goal being the highest long term yield. Even though the duties are to be carried out on a strictly businesslike fashion, certain environmental guidelines are to be adhered to. Accordingly, certain non-commercial activities are accounted for separately and are funded by different governmental departments. The National Environment Protection Board, which is under the Ministry of the Environment, is partly responsible for the non-forestry related uses of the forests such as the national parks, recreation and game management.

The Forest Enterprise collaborates with the ASSI (State Forest Industry) which runs an extensive forest industry business. In fact some members of the Forest Service executive board are also members of the ASSI. The two organizations therefore coordinate operations to jointly achieve the best economic profit.

While the Forest Enterprise tries to achieve a relatively even sustained yield, it is not required to have an even cut year to year. The cut amount may fluctuate depending on demand and prices.

Government control is exercised at the board level through the approval of annual budgets and harvest levels.

## 5.5 Finance

The National Forest Enterprise is supposed to be self financing and is to make a sufficient profit as far as both the development of the company and an annual return to the State are concerned. Revenues include the sale of timber and other resources along with the sale of real estate (up to a maximum limit).

## 5.6 Notes

The forest industry is important to Sweden's economy and most of Sweden's forest land is in private ownership. While the government has been actively promoting more intensive forest management on both private and public lands, private forest owners have nonetheless shown reluctance to cut timber during periods of depressed lumber prices. Forest owners are legally obliged to apply a certain minimum standard of silvicultural density. This involves compulsory reforestation after final felling, compulsory thinning and precommercial thinning if a specified standard density is exceeded, final felling only after a specified maturity is attained, etc.

Sweden has split most of the non-commercial forestry activities away from the commercial activities and has shielded the National Forest Enterprise of Sweden from the political changes of government through a corporate body. The government feels that given minimum reforestation standards, the private sector and the National Forest Enterprise will act in the long term best interests of Sweden by aiming for maximum sustainable yield and maximum economic return.

As 74% of Sweden's forests are privately held, it is interesting to note the organizational difference between the National Board of Forestry (which administers forestry policy on private lands) and the National Forest Enterprise. Whereas the National Forest Enterprise uses a centralized corporate structure, the National Board of Forestry utilizes a decentralized structure where local work is conducted by County Forest Boards whose members are elected or appointed by other locally elected boards. It is evidently easier to administer the Forestry Act as it pertains to private forests through the influence of locally elected boards while the management of public forests is best handled through a classic tight corporate structure.

## 6. Summary

Most of the forestry administrative bodies have recently undergone or are currently undergoing organizational changes which give the forestry administrations more autonomy over their practices and finances. In almost every case, "commercial" activities are separated from "non-commercial" activities whether it be only an accounting split as is the case in Great Britain and New South Wales (Australia) or a complete split as is the case in New Zealand and Sweden. In all cases, the main reason for allowing more autonomy is to free the forestry programs from the changing political moods of the time. If the commercial activities can partially or mostly finance themselves, a greater continuity of programs will result which will allow a long term intensive management program to utilize and develop the forests to their maximum potential.

The growing environmental movement is having its effect on forestry management in all countries. Most environmentalists are afraid that splitting commercial and non-commercial activities gives the commercial administration freedom to act in a manner which may be counter to environmental concerns. Therefore, environmentalists become very concerned with what is and is not included as "commercial" operations. It should be noted that as long as an environmentally sound policy is adopted that encompasses both commercial and non-commercial activities, this concern should be alleviated. However, this area remains as a concern in terms of perception. It is also interesting to note that in Great Britain, even though there are general environmental concerns, environmentalists are asking for a split because they perceive the present forestry department as only following commercial concerns anyway.

Each country is presently looking into having a forestry crown corporation. Great Britain seems to be refraining from such a move due to the cost because of the small relative size of the forestry department. New Zealand has adopted the most radical approach, taking the crown concept one step further. They feel that the private sector does the best job of forestry management over the long term if given the opportunity to do so. Sweden has gone the route of setting up a state-owned forestry company that works in cooperation with the private sector.

Though each country has a unique structure that is appropriate to the country's unique circumstances, a general trend is clear. There is a move towards a separation of commercial and non-commercial activities and a move towards more autonomy of the commercial forestry administration body.

## SECTION VI

## RESTRUCTURING ALTERNATIVES

### 1. Introduction

The proposed restructuring of the present functions of the MOF entails the creation of an independent corporation for the purpose of managing and administering the Province's forest resource assets. The range of viable options for this restructuring is dependent upon the inherent nature of forestry operations.

The following section will present our views of the nature of forestry operations from a financial perspective and provide a comparison of alternative models which we believe warrant consideration in the event a decision is made to restructure.

### 2. Models for Managing Forest Resources

### 2.1 The Mine

A mine exploits a non-renewable resource until it is depleted and then ceases operation. This results in an abandonment of the infrastructure used during the operation of the mine and the need to re-employ and relocate all workers directly and indirectly associated with mining activities.

While such an approach to managing British Columbia's forest resources is clearly inconsistent with the draft vision of the Forest Commission report of September 1990, this model is useful to consider because adopting it produces the maximum financial value obtainable through harvesting the forest resource. However, treating the forest resource as an ore body would not only ultimately lead to massive dislocation of forest industry and dependent workers, but also would obviously have profound implications for other industries such as tourism, fishing etc.

Because of the implications of forestry practice for other aspects of provincial life, it would never be desirable to exploit the full potential of the forest as a wood fibre mine. At the same time, because the Province's economy depends so heavily on forestry activities, finding an alternative source of wood fibre which is sustainable over the long term, would be highly desirable. Therefore, subsequent discussion will be focused on options which assume a sustainable level of forest harvesting.

### 2.2 The Farm

Planting and cultivating trees for future harvest is essentially like running a farm. In British Columbia, with an estimated average growth cycle of over 100 years, there is a very long time between planting and harvest. The combination of a long production cycle and the uncertainty of stumpage rates and the prices which can be obtained for forest products in international commodity markets clearly makes such tree farming a high risk undertaking. Thus farming the forest is an activity which is only suitable for an entity with substantial financial resources or a large stake in sustaining the forest for reasons other than as a source of timber or wood fibre.

### 2.3 The Utility

A utility is an entity which provides an essential service to a group of captive users. The exact market conditions under which various utilities operate varies somewhat but the essential features of utility operation are that, as sole supplier, the utility is required to provide services on terms which are "just and reasonable" to the utility customer and are consistent with the utility's ongoing financial viability. To ensure that these conditions are met, utilities are usually regulated by commissions or boards which are charged with reviewing capital expenditures, operating costs, customer rates and terms of service in a forum which provides for representation of all interested parties.

Since the provision of forest resources is a monopoly in British Columbia, and a number of different groups are affected by the management and administration of this resource, some form of regulatory structure similar to that of a utility might be useful in the administration of these resources to ensure that competing interests are balanced in an effective and accepted way. In the long run, balancing these interests subject to financial constraints may involve a substantial restructuring of forestry activities in British Columbia so that a higher valued-added mix of activities is undertaken.

## 3. Corporate Entity Alternatives

As the above models to be discussed are premised on the creation of an independent corporation, a discussion of alternative corporate entities and corporate structures available for the accommodation of the management and administration functions is presented prior to the discussion of restructuring models.

### 3.1 Crown Corporation

The most common vehicle used by Canadian federal and provincial governments to own and operate commercial ventures is a crown corporation. Crown corporations are established through legislation, are directly or indirectly owned by their respective federal or provincial jurisdictions and are exempt from federal and provincial corporate income tax.

Crown corporation organizational structures generally parallel private sector corporate structures. Crown corporations have a board of directors that can be comprised of a combination of private sector and public sector individuals. Depending on the nature of operations and/or assets controlled, crown corporations may also have similar management and employee structures to that of their private sector counterparts. Management generally consists of a president (or equivalent), a senior management or executive management team and various mid-management to employee levels.

Examples of Provincial crown corporations include B.C. Hydro, B.C. Ferries Corporation, B.C. Rail, B.C. Transit and the Insurance Corporation of B.C.

Generally, the federal and provincial governments guarantee, either directly or indirectly, the financial obligations of their respective crown corporations.

## 3.2 Financing Authority

A second corporate vehicle available to the Province is that of a financing authority. As with a crown corporation, the financing authority is enacted through legislation. An example of a financing authority in the Province is the Municipal Financing Authority ("MFA").

The MFA was established in 1970 by the Municipal Finance Authority of British Columbia Act. The MFA acts as a central borrowing agency for financing the capital requirements of the regional districts and municipalities in the Province. In total, the Province is divided into 29 regional districts, each of which is governed by a Regional Board consisting of representatives of its member municipalities and unincorporated areas. The members of the MFA are appointed by the Regional Boards. The Regional Board member entitlement is based upon each region's population. The executive and administrative powers and duties of the MFA are exercised and performed by a Board of Trustees consisting of a Chairman and six other members, elected annually.

The mandate of the MFA is to effect borrowings on behalf of its members on the most favourable terms and conditions available. The financial obligations of the MFA are not guaranteed either directly or indirectly by the Province, however, the combined credit of all of the regional districts and their municipalities, which together control all of the taxable land and improvements in the Province, stands behind the MFA's obligations. The taxation power and financial structure of the MFA afford it a credit rating equal to or better than that of the Province. The MFA has no input over the approval of specific capital projects but rather is limited to arranging the requisite financing.

## 3.3 Recommended Corporate Entity

We would recommend the selection of a Crown Corporation entity to be used as the vehicle to accommodate the management and administration of the Province's forest resource assets ("Forest Resources Inc.").

The MFA is a single purpose entity. It was established and overlayed on top of an existing infrastructure of regional districts and municipalities to be used as a vehicle to coordinate financing requirements.

At present, no decision has been made with respect to whether or not Forest Resources

Inc.'s functions will be centralized for the Province as a whole or decentralized. In either event, the financing function represents only one of many functions to be mandated. As the Province has, in effect, a "clean slate" with which to proceed, the financing function can be tailored into the structuring of Forest Resources Inc. at the outset.

## 3.4 Corporate Entity Structuring Alternatives

In establishing the appropriate corporate entity structure for Forest Resources Inc., several issues require consideration and review. Certain key issues include:

i) extent of management and administration mandate;
ii) regional considerations;
iii) decision making accountability;
iv) operational requirements/control;
v) financial self sufficiency requirements; and
vi) regulatory requirements/impact.

As these key issues have yet to be resolved, selecting a particular corporate entity structure would be premature. However, for consideration, the following provides an overview of three corporate entity structure options together with their respective strengths and weaknesses.

### 3.4.1 Single Entity Structure

Under the "Single Entity" structure, all of the management and administration functions on a province wide basis would be transferred to a single crown corporation.

### 3.4.2 Parent Entity/Subsidiary Entity Structure

Under the "Parent Entity/Subsidiary Entity" structure, the management and administration functions would be separated on some pre-defined basis, possibly geographically by region or district, and operated in individual subsidiary corporations, wholly-owned by a Crown Corporation Parent Entity. The Parent Entity would house the executive management team and have responsibility for the overall strategic direction of the entity. Under this alternative, certain key administrative functions, including legal, financial, human resources and regulation would be administered by the Parent Entity.

### 3.4.3 Multiple Entity Structure

Under the "Multiple Entity" structure, the management and administration functions would be transferred to multiple Crown Corporation entities possibly determined by geographic regions or districts.

### 3.4.4 Advantages of Corporate Entity Structure Alternatives

All of the above alternatives potentially provide for:

i) the separation of forest resource management and administration from policy creation, regulation and enforcement;
ii) the opportunity to focus on financial and accountability issues and clearly define economic valuation targets; and
iii) the removal of direct political intervention in the management and administration of the Province's forest resource assets.

Until a clear corporate mandate has been developed, selection of one structure over another would be premature. As part of the mandating process, however, the following observations should be considered:

i) the overlap of functions and resultant overall cost structure increases as the structure moves from that of the Single Entity to that of the Multiple Entity alternatives;
ii) alternatively, accountability and the ability to ensure direct regional or district input into the decision making process increases as the structure moves from that of the Single Entity to that of the Multiple Entity alternative.

Possibly overriding the above two observations is a more immediate and practical observation that any decision to create an independent corporate entity introduces dramatic change to the status quo. Of particular concern is the disruption of the personnel currently administering the functions to be restructured. The move from a Single Entity to a Multiple Entity structure increases the extent of change and correspondingly the degree of concern with the change and the risk of failure. For this reason, we would recommend, at least as a transitionary restructuring, the Single Entity alternative be selected. The organizational structure and functional responsibilities of the present management and administrative functions of the Ministry of Forests and Lands could be transferred, to the extent possible, intact to the Single Entity. As the mandate and management solidify under the new corporate entity, a decision to restructure under either the Parent Entity/Subsidiary Entity structure or the Multiple Entity structure could be made at that time.

### 3.5 Forest Resources Inc. Mandate

The initial issue to be considered in establishing the mandate of Forest Resources Inc. will be to determine responsibilities for commercial versus non-commercial activities. Generally defined, commercial activities involve those for which quantifiable cost/benefits are discernable. Silviculture and logging are examples of commercial activities. Non-commercial activities represent those activities for which quantifiable cost/benefit activities are not readily discernable. The removal of productive forest land for recreational purposes and the promotion of logging in otherwise uneconomic areas for public policy considerations are examples of non-commercial activities.

The importance of both commercial and non-commercial activities would suggest management responsibility for both should rest with Forest Resources Inc.. The financial accountability and funding requirements of these two activities, however, should be separated. The user-pay framework of precedent utility operations would create an environment where funding of non-commercial activities would place the cost of such activity on only the user-payors and not necessarily on the eventual recipient of the activity.

To avoid the potential of mismatch or a policy decision to proceed with an uneconomic activity, funding for such activities should be provided for outside the normal funding avenues of Forest Resources Inc.. Such activities could be funded through direct government programs, grants or subsidies.

Defining Forest Resources Inc.'s primary mandate as that of a commercial operation mitigates the complexity of potential issues to be addressed. In general, Forest Resources Inc.'s mandate would provide for:

i) the management and administration of the Province's forest resource assets, including commercial and non-commercial activities;

ii) financial responsibility and accountability for all commercial activities;

iii) the provision and maintenance of a secure supply of timber resources as required for both short term and long term consumption;

iv) value maximization of the Province's forest resource assets; and

v) the overall development and enhancement of the Province's forest resource assets.

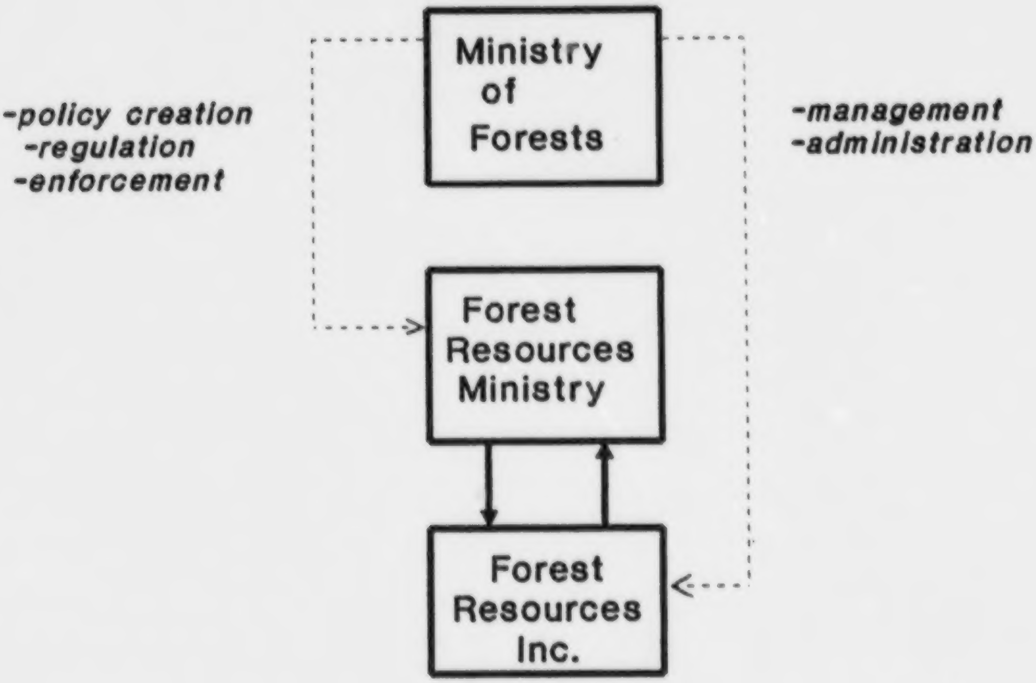
## 4. Restructuring Model Alternatives

The following identifies and discusses two alternatives warranting consideration as model frameworks for a restructuring of the MOF.

### 4.1 Independent Corporation/Forest Resources Ministry Model

This restructuring model, consistent with the concept of a farm, reflects the option as proposed in the Commission's study referenced in Section IV. Under this alternative, the management and administration functions of the MOF would be transferred to a crown corporation ("Forest Resources Inc."). The policy creation function and regulation and enforcement functions would be retained at the ministerial level. This model resembles the structures in place in other jurisdictions as reviewed in Section V.

The following schematic sets out this suggested structure.


Ministry of Forests
-policy creation
-regulation
-enforcement
-management
-administration
Forest Resources Ministry
Forest Resources Inc.

## 4.2 Utility Model

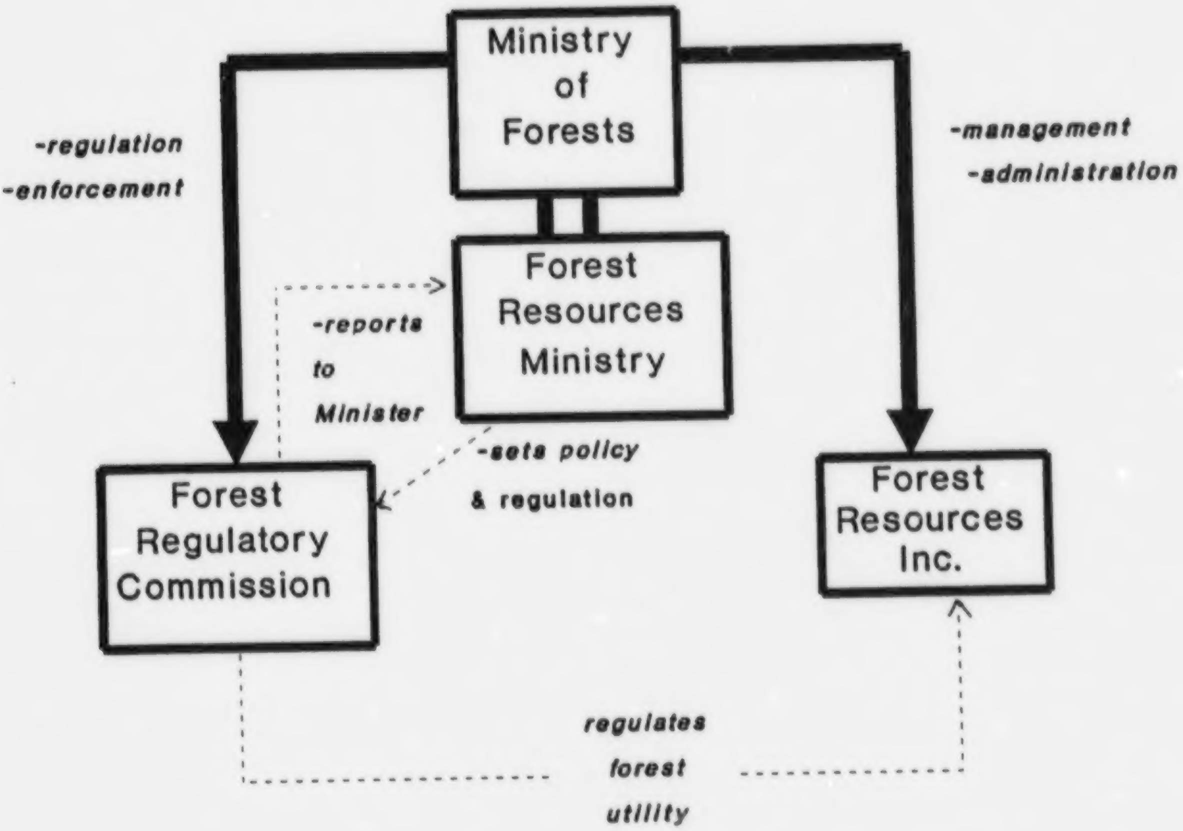
This restructuring model, in addition to separating the management and administration functions proposes a further separation of the policy creation function from those of the regulation and enforcement functions.

This model structure establishes Forest Resources Inc. in the context of a utility operation. As is precedented in other jurisdictions throughout North America, a regulatory environment would be established to ensure the utility did not exert its monopolistic control in the provision of its "goods and services" over the "users" of the goods and services.

Precedent structures in place in the Province are those of B.C. Hydro, the British Columbia Utilities Commission ("BCUC") and the Ministry of Energy and Mines ("Energy and Mines"). B.C. Hydro is the provincial crown corporation electric utility. BCUC is the provincial regulatory body responsible for the regulation of B.C. Hydro together with other provincial utility operations including BC Gas, the private sector investor-owned provincial gas distribution utility. BCUC is mandated with both regulation and enforcement functions and reports to Energy and Mines. Energy and Mines sets policy and regulations under which the BCUC functions; however, the responsibility for regulation and enforcement resides with the BCUC.

A similar model would be plausible under the proposed restructuring. Forest Resources Inc. would be regulated within a conceptual framework, not dissimilar to B.C. Hydro or BC Gas, by a new regulatory commission (the "Forest Commission"). The mandate by which the Forest Commission would regulate would be established by the MOF. In addition, the MOF would be responsible for creating policy to ensure the attainment of provincial goals.

The following schematic sets out the suggested structure.

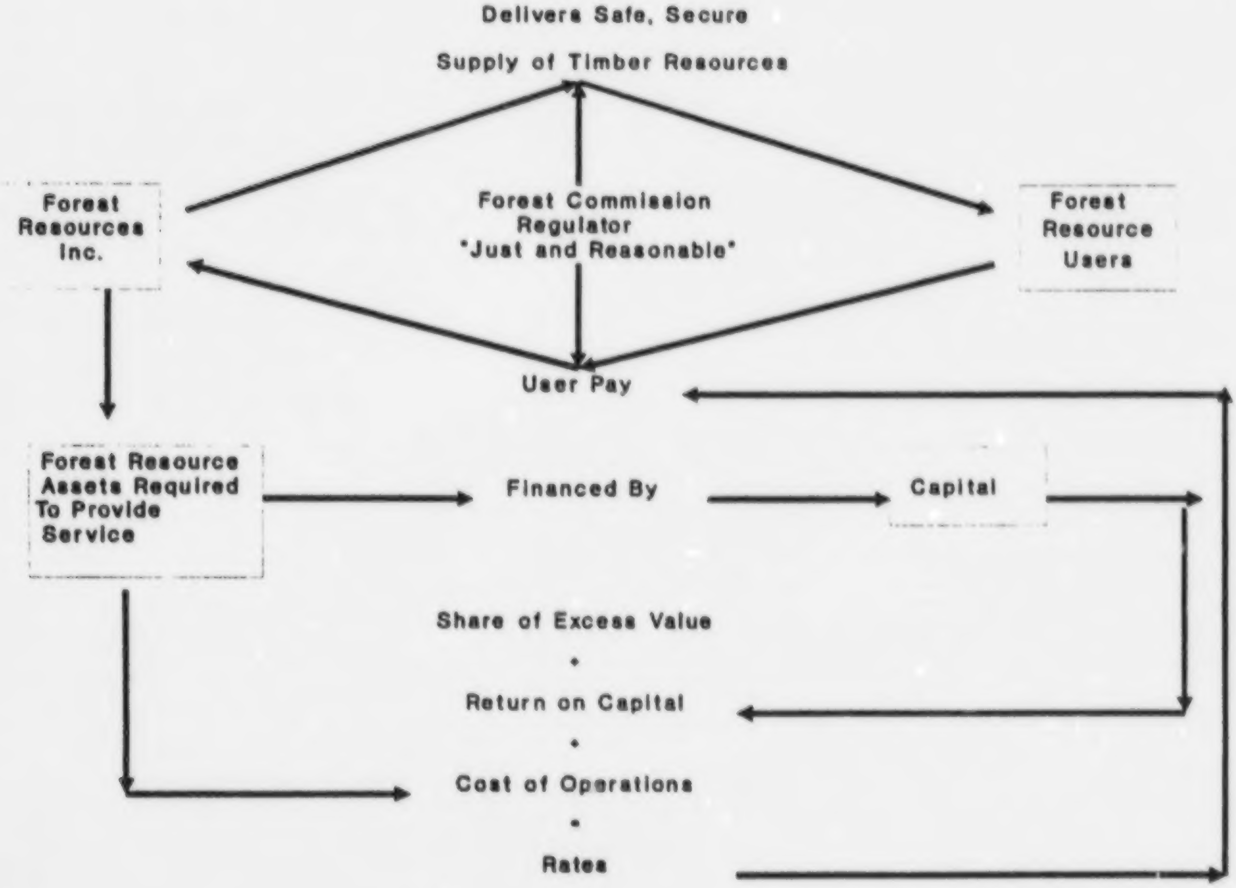

Ministry of Forests
-regulation
-enforcement
-management
-administration
Forest Resources Ministry
-reports to Minister
-sets policy & regulation
Forest Regulatory Commission
Forest Resources Inc.
regulates forest utility

### 4.2.1 Regulation

The design of the regulatory framework and the role of the regulator under either Restructuring Model will require detailed review and consideration. Conceptually, however, the structure and role of the proposed forest utility will parallel that of established regulatory precedent with some necessary adjustments to account for the long term nature of silviculture in B.C. and the inherent limitations of "rate base regulation".

The following schematic details the typical regulatory framework.

ROLE OF THE REGULATOR


Delivers Safe, Secure
Supply of Timber Resources
Forest Resources Inc.
Forest Commission
Regulator
"Just and Reasonable"
Forest Resource Users
User Pay
Forest Resource Assets Required To Provide Service
Financed By
Capital
Share of Excess Value
+
Return on Capital
+
Cost of Operations
=
Rates

There are some key differences between the operation of a sustainable forest and a utility like B.C. Hydro which would require adaptation of the utility model, since normal utility regulation allows funding of only current operating costs and the servicing/recovery of embedded historic capital costs. This method of revenue determination produces the minimum cash flow required to keep the regulated entity afloat on a cash basis and does not reflect in any way changes in value of long term assets as a result of market forces.

The first assumption of traditional utility regulation is that the utility service is so valuable and irreplaceable that the provider of the service is in complete control of pricing in a range which would provide him with extraordinary profits. This ensures he can always recover at least his nominal capital with interest. This assumption may not be true if the British Columbia forest is run as a farm unless substantial changes are made in harvesting economics.

In addition, a normal utility buys or constructs fixed assets, sometimes over a period of years, and then amortizes the cost over a longer period of time, during which these assets provide revenues. A forest is really like an aging whiskey inventory which has layers accumulating costs over a very long period of time and then recovering the costs of the mature layer of inventory in one sale. Thus a forest utility has a long lived inventory which needs to be replaced.

In simple terms, at equilibrium, silviculture expenditures plus all operating and financial costs must be recovered from annual stumpage fees if forestry operations are to be financially self sustaining. In an inflationary environment, in the absence of some form of replacement cost or current value adjustments to inventory, ensuring a match between required inventory replenishment expenditures and accounting costs may not be possible. Therefore, some other basis than the traditional accounting model may be needed for determining this portion of the utility's revenue requirement.

One mechanism for setting stumpage rates might be some form of "Price Cap" regulation, with maximum stumpage rate increases linked to increases in wages and benefits of forest workers, and/or operating costs of forest companies, after a period of adjustment designed to ensure adequate revenues were available to sustain silviculture and operate Forest Resources Inc.. Alternatively, some or all of stumpage rates may be tied to market prices for various products.

The regulatory model depicted above is premised on the user-pay concept. In the above structure, the regulator would act as an intermediary between Forest Resources Inc., the "provider" of the forest resource goods and services and the "users" of the forest resources. As intermediary, the role of the regulator, with respect to Forest Resources Inc. and its users would encompass the following:

**Forest Resources Inc.** - To ensure that Forest Resources Inc. fulfills its responsibility to provide the forest resources both short and long term. In order to maintain the financial resources necessary to provide the supply of forest resource goods and services, the regulator must set adequate rates to ensure sufficient revenues are realized from the provision of such services to cover the operational costs required in the delivery of such services and a sufficient return on capital to meet policy targets set by the Ministry of Forests.

**Forest Resource Users** - To ensure the availability of the forest resources both short term and long term. The regulator must ensure the delivery of the forest resource goods and services and that they are provided at "just and reasonable" rates to the users of the forest resources while ensuring the owners of the resource, the people of British Columbia, receive a fair share of the wealth flowing from this resource.

Although creating the appropriate regulatory structure would require considerable thought and effort to adapt traditional revenue determination practices of utilities to the situation of the forest industry, we believe that the increased financial and administrative discipline imposed by a regulatory body would increase the long run value of the forests.

## SECTION VII

## VALUE ESTIMATIONS

### 1. Introduction

This section provides value estimations of the Province's forest resource assets using the following models for valuation:

i) **Current Stumpage Income Valuation Approach** - this methodology estimates the underlying value of the forest resource assets by estimating the amount of capital the current income generated from the forest resources could support.

ii) **Market Valuation Approach** - this methodology estimates the additional value of the forest resource assets by using private sector transactions.

The objectives of this section are not to identify the absolute range of forest resource values but rather to:

i) illustrate the variance in forest resource asset values derived from the current income generated from the assets as compared to the potential value of such assets viewed from different perspectives;

ii) support the rationale for a change in present forest resource management practices; and

iii) provide the basis for developing a financial framework for enhancing the Province's realizable value of its forest resource assets.

### 2. Current Stumpage Income Valuation Approach

### 2.1 Introduction

The financial value of the Province's forest resource assets is equal to the amount of capital these resource assets can support or service. The magnitude of this capital amount depends upon the amount and prospective growth rate of the annual cash flows generated by these resource assets and the rate at which these cash flows are discounted. This discount rate, in turn, is determined by the general level of prevailing interest rates and the expected variability or perceived risk of these future cash flows.

The concept of a discount rate or effective rate of return is worth exploring, especially since the equity discount rate is often confused with the accounting concept of "return on book equity". In effect, a discount rate is the "effective interest rate" you must earn for you to be willing to receive a cash payment in the future as opposed to holding the cash today. Because discount rates can vary over time, the same prospective cash flow can be valued differently over time. A simple example will illustrate this concept.

Suppose a creditworthy entity promised to pay you \$100 in ten years and your discount rate was 11% for this transaction. Then you would be willing to pay \$35.22 ($\$100/(1.11)^{10}$) today for the promise of repayment of \$100 in ten years. If your discount rate stayed the same, then your wealth would increase by 11% every year (the total wealth at the end of each successive year would be 1.11 times the prior year's wealth). However, if your discount rate changed for any reason, then you would not experience this uniform accrual of wealth.

Suppose that three years after you entered into this transaction you met someone whose discount rate for receiving the \$100 payment in seven years was 8%. Then he would be willing to pay you \$58.35 ($\$100/(1.08)^{7}$) for the right to receive this payment. If your discount rate were higher than 8% for such an investment, you would sell at his discounted value. This would result in an average annual return over the previous three years of 18.33% ($((58.35/35.22)^{1/3} - 1) * 100$).

The purpose of this illustration is threefold. First, it demonstrates that a given future cash flow or stream of cash flows can change in value simply because of a discount rate change; second, it illustrates how returns realized over short holding periods can deviate markedly from the long term discount rate; and, third, it illustrates that using a discounted cash flow model is "computation intensive" and requires more than the operations of addition and subtraction required by the accounting model of valuation.

The first two points bear on some of the uncertainties inherent in valuation and the last on one of the reasons the accounting model is used despite its many limitations.

## 2.2 Capital Structure Considerations

In valuing the expected future cash flows from the forest resource assets, which has an expected product cycle in excess of 100 years, the most conservative approach to valuation is to assume that these resource assets will support only equity investment. This assumption produces the highest discount rate requirement and the lowest amount of supportable capital (value).

A more aggressive valuation approach is to use cash flows generated by the forest resource assets to support debt as well as equity. This could be accomplished if steps were taken to make the cash flows received from this resource more stable and sustainable. In our view, this could be accomplished by holding these resource assets in a crown corporation regulated to ensure that operating, silviculture and financial costs of the corporation were met annually. In its most extreme expression, such an arrangement would result in a "utility like" capital structure and valuation.

## 2.3 Income Analysis

Section IV provides a five year historical review of the revenues and expenditures of the MOF. For purposes of the Current Stumpage Income Valuation, we have assumed that these revenues and expenditures are representative of the operations to be transferred to Forest Resources Inc.. In addition, we have selected fiscal 1990 revenue and expenditure levels for determination of value, because we believe this is the most reliable data which reflects the current structure of revenues received from forestry operations. However, it must be realized that forestry revenues fluctuate from year to year and therefore we have elected to show values which assume a fluctuation of plus or minus 10% from the fiscal 1990 total revenue amount (represents a plus or minus amount of $71.1 million).

**Base Year - Fiscal 1990**

| | ($ Millions) |
|---|---|
| **Revenue** | $ 711.0 |
| **Operating Expenses** | 351.8 |
| **Operating Income** | $ 359.2 |
| | |
| **Silviculture Expense** | $ 206.0 |
| | |
| **Cash Flow Available to Support/Service Capital** | $ 153.2 |

The following analysis assumes that the $206.0 million silviculture expenditure is sufficient to sustain the allowable annual cut. If this is not true, then the values produced will need to be reduced/increased by the present value of the additional/reduced expenditures required to ensure a sustainable annual cut at current levels.

## 2.4 Equity Model

This model assumes that Forest Resources Inc. is entirely financed with equity supplied by the Province. This assumption is consistent with the long term nature of silviculture investment, the present uncertain future cash flow pattern, and the pioneering nature of this endeavour.

With respect to the appropriate rate of return on equity, we have selected a nominal rate of 18% per annum. This rate has been selected because we believe it provides an acceptable premium over the Province's current long term cost of borrowing of 11% in view of the long product cycle associated with silviculture in B.C. and it equals the market return on equity realized by the provincial forest industry from 1980 to 1989.

For purposes of this valuation, we assume that the annual cash flow available to support capital is $153.2 million. In the simplest case, annual cash flows would fluctuate around this amount in perpetuity. However, it is very likely that this cash flow will grow over time in an inflationary economy. The 18% per annum nominal rate incorporates some allowance for future inflation. To maintain consistency between the discount rate and the projected cash flow pattern, we have assumed the cash flows will increase at an annual rate of 4%. This is equivalent to assuming a real discount rate of 13.5% (((1.16/1.04) - 1) 100).

### Equity Value Estimate

Based on the above assumptions, the value of Forest Resources Inc. financed with 100% equity can be estimated as follows:

Total Value = Cash Flow/Discount Rate

where:

| | | | | |
|---|---|---|---|---|
| Cash Flow Available to Service Capital | = | Base Case | - | $153.2 million |
| | | High | - | $224.3 million (+ $71.1) |
| | | Low | - | $ 82.1 million (- $71.1) |
| Appropriate Real Discount Rate | = | 13.5% | | |

therefore:

| | Low | Base Case (Millions) | High |
|---|---|---|---|
| **Total Value Estimate Range** | **$608** | **$1,135** | **$1,661** |

If any of our assumptions prove inappropriate, the value estimate will change accordingly.

### 2.5 Leveraged Model

This model assumes the adoption of a regulatory environment that will ensure a highly stable source of cash flow available to service capital which would enable Forest Resources Inc. to be financed with both debt and equity from the outset.

With respect to the selection of an appropriate debt/equity structure for Forest Resources Inc., we reviewed comparable capital structures for other provincial crown utilities. Table 2.5.A provides a summary of the capital structure comparables selected.

## Table 2.5.A
## Comparable Crown Corporation Capital Structures

| | Long Term Debt | | Equity | | Total | |
|---|---|---|---|---|---|---|
| | $ Millions | % | $ Millions | % | $ Millions | % |
| B.C. Hydro | $ 6,727 | 80.0% | $ 1,677 | 20.0% | $ 8,404 | 100% |
| Saskatchewan Power | 1,232 | 54.3% | 1,036 | 45.7% | 2,268 | 100% |
| Manitoba Power | 3,802 | 94.4% | 227 | 5.6% | 4,029 | 100% |
| Ontario Hydro | 26,312 | 80.7% | 6,287 | 19.3% | 32,599 | 100% |
| Quebec Hydro | 22,519 | 73.2% | 8,233 | 26.8% | 30,752 | 100% |
| New Brunswick Electric | 1,918 | 81.7% | 431 | 18.3% | 2,349 | 100% |
| Nova Scotia Power | 1,481 | 97.3% | 41 | 2.7% | 1,522 | 100% |
| Newfdld & Labrador Hydro | 1,597 | 76.8% | 483 | 23.2% | 2,808 | 100% |
| Total/Average | $65,588 | 78.1% | $18,415 | 21.9% | $84,003 | 100% |

As shown, the average debt/equity structures for the crown comparables is approximately 80% debt and 20% equity. This average capitalization is consistent with that for B.C. Hydro. For this reason, we believe an appropriate target for Forest Resources Inc.'s capital structure would be 80% debt and 20% equity.

With respect to the appropriate rates of return on the capital components, we have assumed the following:

i) for long term debt, a rate of 11% per annum which is equivalent to the current Provincial long term borrowing rate; and

ii) for equity, a rate of 13.2% per annum which is consistent with the return targeted for the Province's equity investment in B.C. Hydro, and is calculated as follows:

Provincial long term borrowing rate - 11% per annum
B.C. Hydro allowed interest coverage - 1.3 times
Proposed debt/equity structure - 80/20

therefore, the return on equity is calculated as:

$$11\% \times (1.3 - 1)(.8/.2) = 13.2\%$$

We note in passing that this return on equity seems to be quite low, especially in view of the "thin" equity base. However, the debt of a crown utility does not rely solely on the credit quality of the utility, but depends upon the Provincial guarantee. This means that the capital structure of such a utility is highly artificial. Therefore, this model provides a "low end" estimate of the appropriate equity discount rate.

## Leveraged Model Estimate

Based on the above assumptions, the value of Forest Resources Inc. financed in the context of a leveraged capital structure can be estimated as follows:

Total Capital = Total Value

where;

Total Capital = Cash Flow/Weighted Average Cost of Capital

where;

Cash Flow Available to Service Capital = Base Case - $153.2 million
High - $224.3 million (+ $71.1)
Low - $ 82.1 million (- $71.1)

Weighted Average Cost of Capital = Debt Proportion * Interest Rate + Equity Proportion * Return on Equity

where;

Debt Proportion = .8
Interest Rate = 11%
Equity Proportion = .2
Return on Equity = 13.2%

therefore;

Weighted Average Cost of Capital = 11.44%

and;

Total Capital = Base Case - $1,339 million
High - $1,961 million
Low - $ 718 million

| | Low | Base Case<br>(Millions) | High |
|---|---|---|---|
| **Total Value Estimate Range** | **$718** | **$1,339** | **$1,961** |

In deriving the above value, we did not adjust the nominal equity discount rate to reflect anticipated inflationary growth in cash flows because in the case of a regulated utility, revenues are set to recover embedded capital costs and do not necessarily reflect general rates of inflation. If traditional regulatory practices were adapted to provide some mechanism for adjusting embedded costs to current replacement levels, then the valuation using the utility model would be substantially higher.

## 3. Market Valuation Approach

### 3.1 Introduction and Major Assumptions

The crown's portion of British Columbia's productive forest base is estimated at 21.3 million hectares per Table 3.1.1. The volume of mature crown timber is estimated at 6.3 billion cubic metres per Table 3.1.2.

Of the total provincial harvest of 85.2 million cubic metres of timber for the fiscal year ended March 31, 1989, 75.6 million cubic metres, or 89%, was harvested from crown lands (see Table 3.1.3). Tree farm licenses, forest licenses and timber sale licenses (major) accounted for 59.8 million cubic metres of the crown harvest as compared to an allowable annual cut for these tenures of approximately 61.7 million cubic metres.

The largely closed market tenure system in British Columbia makes it difficult to derive an objective, market driven valuation for crown timber. The difficulty is compounded by the limited data available on which to base such an analysis.

There are three market mechanisms which offer evidence of at least a degree of competitive pricing:

- Private sector purchases of crown forest tenures.
- Log market sales in the Vancouver Log Market.
- Small Business Forest Enterprise Program (SBFEP) sales under Section 16 of the Forest Act.

These pricing mechanisms form the foundation of the accompanying valuation. Major assumptions incorporated into the valuation are as follows:

- The current allowable annual cut is sustainable for at least 30 years. Although all net present value (N.P.V.) analysis performed assumes a 100 year time frame, the first 30 years picks up over 90% of the total N.P.V.

- The current provincial forest industry infrastructure is not altered. No changes in efficiency, productive capacity or product mix are assumed.

- The industry's recent historical return on invested capital represents a desirable long term return target.

- The timber harvested is representative in mix and quality of the remaining stands. As a subset, it is assumed that SBFEP harvest is representative of the total harvest.

- The valuation uses recent data with a maximum retrospective of three years. This gives full weight to the structural changes in timber supply and pricing which have occurred over this time frame.

### 3.2 Private Sector Sales Approach

A reasonably active market exists in the private sector sale of crown forest tenures as evidenced by over 60 Section 50(1) [Forest Act] approvals of ownership transfers involving quota having occurred over the past decade.

There is no requirement for public disclosure of pricing relating to tenure sales. Recent tenure sales data, as summarized in Table 3.2.1., was therefore restricted to public company transactions where estimates could be derived from published annual or quarterly reports.

The data gathered, expressed on a dollar paid per cubic metre of allowable annual cut basis, relates principally to the Vancouver and Prince George forest regions. A relative value calculation was developed to apply the data to the other four forest regions as follows:

- Forest regions were aligned for comparison purposes. Prince Rupert was linked to Vancouver due to similarities in species mix and relatively uniform logging costs. Kamloops, Nelson and the Cariboo were linked to Prince George due to similarities in species mix.

- Small Business Forest Enterprise Program ("SBFEP") bid data was utilized as the basis for developing relative ratios between regions. The SBFEP bid data was selected in preference to average stumpage price data due to concerns over possible salvage sale distortions in the Cariboo and Prince Rupert.

  The relative value ratios derived from the two data bases are compared below:

|  | **Relative Ratios** |  |
|---|---|---|
|  | **SBFEP Bid Basis** | **Average Stumpage Basis** |
| **Prince Rupert (% of Vancouver)** | 84% | 60% |

| | | |
|---|---|---|
| **Cariboo (% of Prince George)** | 73% | 46% |
| **Kamloops (% of Prince George)** | 73% | 65% |
| **Nelson (% of Prince George)** | 57% | 61% |

***Data Source: MOF Annual Report, 1988 - 1989***

The private sector value ranges established for the Vancouver and Prince George forest regions and the relative value ranges derived for the other four forest regions were then married to the allowable annual cut for each region to arrive at an overall value range for crown timber **in excess of stumpage** (see Table 3.2.3).

The values arrived at are summarized below:

| | **Estimated Market Value ($ Billions)** | | |
|---|---|---|---|
| | **Low** | **Base Case** | **High** |
| **Value in Excess of Existing Stumpage** | $1.84 | $3.17 | $4.50 |

The values arrived at reflect the net present value of the future earnings stream expected to accrue to the purchaser. Implicit in this value are the purchaser's discount rate applied and the purchaser's assumptions as to the impact of inflation and structural changes in timber supply/demand on future cash flow growth.

The weighted average cost of capital for the British Columbia forest products industry is used as a proxy for the purchaser's discount rate. It was calculated as follows:

**Weighted Average Cost of Capital Calculation:**

| Industry Capital Structure | % | Component Costs | Weighted Average Cost of Capital |
|---|---|---|---|
| **Debt** | 36 * | 6.8% *(1)* | 2.5% |
| **Equity** | 64 * | 18.0% ** | 11.5% |
| | | | 14.0% |

* *Data Source: Price Waterhouse report "The Forest Industry in British Columbia, 1989"*

** *Based on 1980-1989 review of TSE 300 Paper and Forest Products Index total returns. Suggests investors expect a risk adjusted return on equity of about 800 basis points over 1-3 year Canadian government bonds.*

(1) *After tax costs, reflects 11% average interest rate on debt, 38% tax rate (1989)*

Once an asset value and discount rate are determined, the only missing ingredient required to calculate the corresponding cash flows is an estimated inflation rate. Using an estimated inflation rate of 4% makes a 14% nominal discount rate equal to 9.62% (((1.14/1.04) - 1) * 100).

Consequently, the first year after tax income stream implied by the base case estimate of excess stumpage value is 3.17 x 0.00962 = $305.0 million. Adjusting this to a pre-tax basis, assuming a 38% tax rate, gives the equivalent pre-tax cash flow of $491.9 million. Therefore, the range of values in excess of existing stumpage implicitly reflects the following income streams:

| | Income Stream ($ Millions Per Annum) | | |
|---|---|---|---|
| | Low | Base Case | High |
| **Pre-tax** | $285.0 | $491.9 | $696.9 |
| **After-tax** | 177.0 | 305.0 | 432.1 |

Should the Province elect to collect this income stream as additional stumpage fees (i.e. this would create a value on sale of tenure of nil), the following valuation would emerge from the Provinces' perspective:

| | | Net Present Value Ranges ($ Billions) | | |
|---|---|---|---|---|
| | **Rate** | **Low** | **Base Case** | **High** |
| **Additional Stumpage** | 13.5% | $2.12 | $3.64 | $5.16 |
| **Existing Stumpage** * | 13.5% | 0.61 | 1.14 | 1.66 |
| | | $2.73 | $4.78 | $6.82 |

***** *Per Section 2.4*

The foregoing table presents values based upon the real equity discount rate of 13.5% derived previously. If we apply the nominal discount rate of 11.44% derived from our utility model, then the values would be adjusted upward as follows:

| | | Net Present Value Ranges ($ Billions) | | |
|---|---|---|---|---|
| | **Rate** | **Low** | **Base Case** | **High** |
| **Additional Stumpage** | 11.44% | $2.49 | $4.30 | $6.09 |
| **Existing Stumpage** | 11.44% | 0.72 | 1.34 | 1.96 |
| | | $3.21 | $5.64 | $8.05 |

These values indicate the amount of capital which could be supported in year one with a capital structure of 80% debt 20% equity as described earlier.

If one presumes that inflation will continue so that stumpage rates could continue to rise, then additional amounts of capital could be supported in future years. One way to quantify the total value which could be achieved in this manner is to discount the cash flows implicit in recent tenure transactions at a real discount rate.

Converting 11.44% to a real discount rate assuming 4% inflation gives a value of 7.15%.

Applying this value to estimated cash flows yields the following table of values:

| | | Net Present Value Ranges ($ Billions) | | |
|---|---|---|---|---|
| | **Rate** | **Low** | **Base Case** | **High** |
| **Additional Stumpage** | 7.15% | $3.99 | $6.88 | $9.75 |
| **Existing Stumpage** | 7.15% | 1.15 | 2.14 | 3.14 |
| | | $5.14 | $9.02 | $12.89 |

These values could be achieved if the regulatory process were adapted to allow the recapture of inflationary price increases.

### 3.3 Log Market Sales Approach

Logs traded on the Vancouver Log Market ("VLM") accounted for approximately 25% of the total coastal allowable annual cut in 1989. The VLM has often been characterized as being at least somewhat non-competitive due to:

- Limited sellers relative to buyers. The ratio of buyers to sellers is roughly 7 to 1.
- A heavy incidence of logs for chips and logs for logs trading. This is felt to create pricing distortions and prevent buyers who do not have logs for exchange from entering the market.

The limitations of the VLM are acknowledged in the analysis. VLM log pricing (Table 3.3.2) is applied to the coastal species mix (Table 3.3.1) to arrive at a weighted average log price (Table 3.3.3). The estimated coastal logging cost is deducted to arrive at a gross residual value to log. The total coastal log production is then flowed through the coastal lumber, pulp and newsprint mills to arrive at an excess profit or loss determination. The excess profit/loss relates to the surplus/shortfall relative to a 14% per annum return on capital employed. The time frame for the analysis was 1987-1989 with values being averaged over this period.

The average excess profit before stumpage or royalty was found to be $442.6 million. Pro-rating the log production for the total pertaining to crown tenures (2/3) reduces the value to $295 million. Applying a 7.15% real discount rate produces a net present value for coastal crown timber of $4.12 billion. This is in the mid-range of section 3.2 values for the coast as calculated in the table that follows.

**Net Present Value Ranges**
**($ Billions)**

| | Low | Base Case | High |
|---|---|---|---|
| **Additional Stumpage** | | | |
| **Vancouver** | $1.55 | $2.97 | $4.38 |
| **Prince Rupert - Coast (13%)** | .07 | .13 | .19 |
| **Existing Stumpage** | | | |
| **Vancouver (37%) *** | .43 | .79 | 1.16 |
| **Prince Rupert - Coast (1%) *** | .01 | .02 | .03 |
| | $2.06 | $3.91 | $5.76 |

** Pro-rata on total MOF stumpage revenue*

## 3.4 Small Business Forest Enterprise Program ("SBFEP") Sales Approach

Under the SBFEP, timber is sold in three ways:

(1) Competitive Sales (Section 16 of the Forest Act): These sales are sold to the highest bidder. A minimum upset stumpage price is established and registered parties tender an additional amount called the bonus bid. These sales are usually for a one to two year term. There are three categories of competitive sales:

- Category 1 for timber harvesters who do not own or lease a timber processing facility.
- Category 2 for manufacturers of forest products (essentially small sawmillers) who do not hold licences with an aggregate allowable annual cut in excess of 10,000 m3.
- Category 1 or 2. Any party registered in either category can bid on the sale.

(2) Bid Proposal Sales (Section 16.1): These sales are awarded to manufacturers on the basis of the best contribution of value-added and bonus bid.

(3) Direct Sales (Section 18): These are generally small quota sales awarded directly without competition.

The SBFEP accounts for approximately 12% of the provincial allowable annual cut. The breakdown by sale type is as follows:

| | (000 m3) |
|---|---|
| Competitive Sales | |
| Category 1 | 2,933 |
| Category 2 | 988 |
| Category 1 or 2 | 1,463 |
| | 5,384 |
| Bid Proposal Sales | 3,508 |
| Direct Sales | 252 |
| | 9,144 |

The focus of the analysis is on competitive sales. A sample of 75 of the larger Category 1 sales (see Table 3.4.1 for results and selection basis) and 21 of the largest Category 2 sales was taken. The Category 2 sales were found to fall short of the Category 1 sales in terms of prices paid in all forest regions except Prince George. In 10 cases no bonus bid was paid. Category 2 sales were therefore rejected in terms of being representative of what an average efficient and/or value added manufacturer is capable of paying for fiber supply in an open bidding environment.

Applying the regional Category 1 sample values to the allowable annual cut produces gross revenues to the Province of $1.425 billion. Adjusting the bids downward for the fact that basic silvicultural activities rest with the Province under SPFEP sales, reduces the gross revenue to $1.407 billion (the Province, based on the MOF Annual Report 1988-89, is spending $.30 per cubic metre on silviculture under the SBFEP). Deducting MOF expenses of $557.8 million (per section 2.2) produces net revenue of $849 million.

Allowing for the risk of pricing distortions at the regional level due to the sample size and to be consistent with the other valuation methodologies employed which were largely driven off of fiscal year ended March 31, 1990 data, a more conservative approach is to simply double the stumpage revenue in reflection of the bonus bid being, on average and net of silvicultural costs, twice the upset stumpage rate. This would produce incremental stumpage revenue of $458 million. Adjusted total net base case revenue to the Province would be $611 million. Net present value ranges for the two net revenue streams can be found in the table that follows.

| | Net Present Values ($ billions) |
|---|---|
| **Category 1 Sample Approach** | |
| **(a) discount rate @ 13.50%** | $6.29 |
| **(b) discount rate @ 11.44%** | 7.42 |
| **(c) discount rate @ 7.15%** | 11.86 |
| **Conservative Approach** | |
| **(a) discount rate @ 13.50%** | $4.53 |
| **(b) discount rate @ 11.44%** | 5.34 |
| **(c) discount rate @ 7.15%** | 8.54 |

### 3.5 Summary

Averaging base case values for the market valuation and SBFEP (conservative) sales approaches produces the following range of crown timber values:

| | Market Valuation | SBFEP (Conservative) ($ Billions) | Average |
|---|---|---|---|
| **Discount rate @ 13.5%** | $4.78 | $4.53 | $4.68 |
| **Discount rate @ 11.44%** | 5.64 | 5.34 | 5.49 |
| **Discount rate @ 7.15%** | 9.02 | 8.54 | 8.78 |

# TABLE 3.1.1
# SUMMARY OF PROVINCIAL FOREST LAND AREA: TSA's AND TFL's

| | | Area in Hectares |
|---|---|---|
| Total Area - Excluding Major Parks | | 88,907,918 |
| Alienations | | |
| · Crown Grants | | |
| · Parks | | |
| Total Alienations | 6,938,022 | |
| Unalienated Area | | 81,969,896 |
| Non Forest | | |
| · Alpine Forest | | |
| · Water | | |
| · Open Range | | |
| Total Not Productive | 38,705,293 | |
| Forest Land | 43,264,603 | |
| Land Losses Accounted For in TSA Reports | | |
| · ESA's and Land Withdrawals | | |
| Total Not Available | 2,383,746 | |
| Available Forest Land | | |
| Not Suitable | | |
| · Inoperable | | |
| · Problem Forest Types | | |
| Total Not Suitable | 14,713,917 | |
| Potentially Productive Available and Suitable | | 26,166,940 |
| Not Stocked | | |
| · NSR/DSD | | |
| · NC | | |
| Total Not Stocked | 3,560,368 | |
| Presently Productive Available and Suitable | | 22,606,572 |
| Land Losses Not Accounted For in TSA Reports | | |
| Total Additional Not Available | 1,316,226 | |
| Net Presently Productive Available and Suitable | | 21,290,346 |

*Data Source: MOF Range and Resource Analysis (1984)*

## TABLE 3.1.2
## MATURE SPECIES VOLUME: ALL TIMBER SUPPLY AREAS, CROWN LAND

| Forest Region | Mature Volume (000 m3) |
|---|---|
| Cariboo | 598,057 |
| Kamloops | 537,104 |
| Nelson | 325,925 |
| Prince George | 1,997,789 |
| Prince Rupert | 1,541,556 |
| Vancouver | 1,296,334 |
| | 6,296,765 |

*Data Source: MOF, Inventory Branch*

### TABLE 3.1.3
### VOLUME BILLED BY LAND STATUS
### FISCAL YEAR ENDED MARCH 31, 1989

| Land Status | Volume Billed (000 m3) |
|---|---|
| Crown Land | |
| Tree Farm License | 12,751 |
| Forest License | 42,503 |
| Timber Sale License | |
| · Major | 950 |
| · Minor | 9,760 |
| License to Cut | 1,602 |
| Timber License | |
| · Within TFL | 3,610 |
| · Outside TFL | 3,400 |
| Woodlot License | 413 |
| Other | 632 |
| | 75,621 |
| Private Land | 9,262 |
| Federal Land & Indian Reserves | 306 |
| | 85,189 |

*Data Source: MOF*

## TABLE 3.2.1
## RECENT PUBLIC COMPANY
## TIMBER TRANSACTIONS/VALUATIONS

| | Valuation Source | Allowable Annual Cut (1) (000 m3) (2) | Estimated Timber Value ($ millions) | Timber Value/m3 | Forest Region | Date |
|---|---|---|---|---|---|---|
| **Tree Farm Licenses** | | | | | | |
| **Doman/Western Forest Products Limited Moresby Island Claim** | Independent Valuation | 317 | $105 *(3)* | $331 | Vancouver | Third Quarter 1990 |
| **Forest Licenses** | | | | | | |
| **International Forest Products Limited ("Interfor")** | Internal Valuation | 2,000 | $100 *(2)* | $50 | Vancouver (1,542)<br>Prince Rupert (227)<br>Kamloops (250) | Third Quarter 1989 |
| **Interfor Purchase of Doman Forest Products Limited Quota** | | 80 | $3 *(3)* | $37.50 | Vancouver | January 1990 |
| **Interfor Purchase of Jackson Bros. Logging Co. Ltd.** | | 61.5 | $6-7 *(2)* | $97.50-$113.75 | Vancouver | January 1990 |
| **Slocan Forest Products Ltd. Purchase of Tackama Forest Products Ltd.** | | 684.3 *(5)* | $21 *(4)* | $30.70 *(5)* | Prince George | October 1990 |
| **Canadian Forest Products Ltd. Purchase of Balfour Forest Products Inc.** | | 1,673 | $104 *(3)* | $62.16 | Prince George (1,627)<br>Cariboo (46) | May 1989 |

*(1)* *Where applicable, adjusted for 5% loss on change of ownership*
*(2)* *Derived from public data*
*(3)* *Derived from annual or quarterly reports*
*(4)* *Assumes Tackama's processing assets were valued at approximately $14 million*
*(5)* *Excludes a non replaceable license due 2,001 with an AAC of 145,000 m3 believed to be of notional quality*

# TABLE 3.2.2
# ALLOWABLE ANNUAL CUT ON TENURED CROWN LAND
(000 m3)

| Forest Region | ----Allowable Annual Cut---- Tree Farm Licenses * | Forest Licenses and Other | Total |
|---|---|---|---|
| Cariboo | 109 | 7,080 | 7,189 |
| Kamloops | 808 | 5,831 | 6,639 |
| Nelson | 1,430 | 4,131 | 5,561 |
| Prince George | 1,153 | 14,362 | 15,515 |
| Prince Rupert | 1,258 | 6,479 | 7,737 |
| Vancouver | 11,061 | 8,063 | 19,124 |
|  | 15,819 | 45,946 | 61,765 |

* *Excludes Schedule A Licenses*
*Data Source: MOF*

# TABLE 3.2.3
# CROWN TIMBER VALUATION BASED ON RECENT PRIVATE SECTOR TRANSACTIONS/VALUATIONS

| Forest Region | Allowable Annual Cuts (000 m3) | Value/m3 Low | Value/m3 Average | Value/m3 High | Total Value ($ millions) Low | Total Value ($ millions) Average | Total Value ($ millions) High |
|---|---|---|---|---|---|---|---|
| Cariboo ** | 7,189 | $22.41 | $33.89 | $45.38 | $161 | $244 | $326 |
| Kamloops ** | 6,639 | 22.41 | 33.89 | 45.38 | 149 | 225 | 301 |
| Nelson ** | 5,561 | 17.50 | 26.47 | 35.43 | 97 | 147 | 197 |
| Prince George | 15,515 | 30.70 | 46.43 | 62.16 | 476 | 720 | 964 |
| Prince Rupert ** | 7,737 | 31.50 | 60.12 | 88.73 | 244 | 465 | 687 |
| Vancouver | 19,124 | 37.50 | 71.57 | 105.63 * | 717 | 1,369 | 2,020 |
| | 61,765 | | | | $1,844 | $3,170 | $4,495 |

* *Mid-point of Jackson Bros. estimated timber value range*

** *Reflects the following relative value factors: Cariboo and Kamloops at 73% of Prince George; Nelson at 57% of Prince George; and Prince Rupert at 84% of Vancouver*

## TABLE 3.3.1
## GROSS VOLUME BY MATURE SPECIES
(million m3)

| | Coast | | | Total Province |
|---|---|---|---|---|
| Species | Volume | % | Interior | |
| Spruce | 146 | 4.8 | 1,625 | 1,771 |
| Hemlock | 1,235 | 40.6 | 584 | 1,818 |
| True Firs | 497 | 16.3 | 1,131 | 1,628 |
| Lodgepole Pine | 23 | 0.7 | 1,386 | 1,409 |
| W. Red Cedar | 703 | 23.1 | 173 | 876 |
| Douglas Fir | 276 | 9.1 | 260 | 536 |
| Cypress | 158 | 5.2 | 5 | 163 |
| White Pine | 7 | 0.2 | 13 | 19 |
| Larch | -- | -- | 23 | 23 |
| Yellow Pine | * | | 8 | 8 |
| Miscellaneous | * | | 11 | 11 |
| Total Softwood | 3,045 | 100.0 | 5,218 | 8,263 |
| Total Hardwood | 16 | | 309 | 325 |
| Total All Species | 3,061 | | 5,527 | 8,588 |

* *Less than .5 million m3*
*Data Source: COFI, MOF*

## TABLE 3.3.2
## VANCOUVER LOG MARKET
## AVERAGE SELLING PRICE OF LOGS 1987 - 1989
## ($/m3)

| Species | Year | --------Average Price on Grade-------- | | | All Grades |
|---|---|---|---|---|---|
| | | No.1 | No.2 | No.3 | |
| Spruce | - 1989 | $579.62 | $176.18 | $54.87 | $133.96 |
| | - 1988 | 324.82 | 171.60 | 49.78 | 118.56 |
| | - 1987 | 315.40 | 120.77 | 43.40 | 109.48 |
| Hemlock | - 1989 | 98.68 | 68.97 | 46.35 | 50.41 |
| | - 1988 | 117.38 | 73.71 | 43.13 | 49.09 |
| | - 1987 | 82.39 | 58.44 | 37.19 | 41.39 |
| True Firs * | - 1989 | 89.16 | 69.77 | 48.60 | 55.89 |
| | - 1988 | 89.61 | 74.65 | 45.34 | 53.21 |
| | - 1987 | 70.64 | 59.38 | 38.59 | 43.90 |
| Pine | - 1989 | 97.97 | 58.96 | 16.82 | 27.06 |
| | - 1988 | 67.84 | 43.28 | 14.12 | 23.83 |
| | - 1987 | 61.73 | 43.91 | 20.19 | 29.50 |
| Cedar | - 1989 | 90.53 | 73.40 | 47.12 | 61.06 |
| | - 1988 | 98.42 | 79.83 | 51.03 | 67.76 |
| | - 1987 | 97.33 | 74.55 | 46.45 | 64.01 |
| Douglas Fir | - 1989 | 300.36 | 88.05 | 47.15 | 71.63 |
| | - 1988 | 231.80 | 80.85 | 37.83 | 61.22 |
| | - 1987 | 218.96 | 73.51 | 36.79 | 62.95 |
| Cypress | - 1989 | 516.34 | 230.27 | 55.93 | 129.05 |
| | - 1988 | 462.43 | 248.04 | 73.38 | 150.94 |
| | - 1987 | 590.24 | 350.28 | 105.68 | 214.32 |

* *#1 = Peeler*
*#2 = Lumber*
*#3 = Pulp*

*Data Source: COFI*

# TABLE 3.3.3
# COASTAL TIMBER VALUATION DERIVED FROM VANCOUVER LOG MARKET AND COASTAL FOREST INDUSTRY DATA

| Species | % of Mature Coastal Timber *(1)* | 1987 - 1989 Average Log Market Price ($/m3) *(2)* | Weighted Average Price ($/m3) |
|---|---|---|---|
| **Spruce** | 4.8% | $120.67 | $5.79 |
| **Hemlock** | 40.6 | 46.96 | 19.07 |
| **True Firs** | 16.3 | 51.00 | 8.31 |
| **Pine** | 0.9 | 26.80 | 0.24 |
| **Cedar** | 23.1 | 64.28 | 14.85 |
| **Douglas Fir** | 9.1 | 65.27 | 5.94 |
| **Cypress** | 5.2 | 164.77 | 8.57 |
|  | 100.0% |  | $62.77 |
| **Estimated Coastal Logging Cost Before Stumpage or Royalty** |  |  | $45.82 *(3)* |
| **Gross Residual Value to Log** |  |  | $16.95 |
| **1987 - 1989 Average Coastal Log Production (million m3)** |  |  | 32.20 *(3)* |
| **Logging Contribution** |  |  | $545.79 million |
| **Excess Profit (Loss): (see Attachments #'s 1 - 4)** |  |  |  |
| **Coastal Lumber - usage 13.0 million m3** |  |  | (149.10) |
| **Coastal Pulp - usage 13.6 million m3** |  |  | 55.50 |
| **Coastal Newsprint - usage 5.6 million m3** |  |  | (9.60) |
|  |  |  | ($103.20) *(5)* |
| **Excess Profit Before Stumpage or Royalty** |  |  | $442.59 million |

---

*(1)* *Per Table 3.3.1*

*(2)* *Per Table 3.3.2*

*(3)* *Per Price Waterhouse report "The Forest Industry in British Columbia 1989"*

*(4)* *Data Source: MOF*

*(5)* *Coastal plywood and veneer operations are not considered material for the purposes of this calculation*

# ATTACHMENT 1
# ESTIMATED NET HARVEST UTILIZED BY SECTOR
## AVERAGE 1987 - 1989

| | Coastal | | | |
|---|---|---|---|---|
| | Lumber | Pulpmill | Newsprint | |
| | | (million m3) | | |
| **Gross Fibre Usage** | 20.0 | 14.2 | 5.9 | 40.1 |
| **Net Chip Production** | (7.0) | -- | -- | 7.0 |
| **Net Fibre Usage** | 13.0 | 14.2 | 5.9 | 33.1 |
| **Coastal Fibre Available** | -- | -- | -- | 32.2 |
| **Estimated Interior Transfer by Sector** | -- | (0.6) | (0.3) | (0.9) |
| **Net Coastal Utilization** | 13.0 | 13.6 | 5.6 | 32.2 |

*Data Source: Price Waterhouse Report "The Forest Industry in British Columbia 1989"*

# ATTACHMENT 2
# CALCULATION OF EXCESS COASTAL LUMBER PROFIT (LOSS)

| | 1987 - 1989 Average |
|---|---|
| Capital Employed ($ millions) | 1,098.30 |
| Estimated Required Return | 14% |
| Estimated Required Annual Net Earnings ($ millions) | 153.80 |
| Net Fibre Usage (million m3) | 13.00 |
| Required Net Earnings/m3 Required | 11.83 |
| Actual Net Earnings ($ millions) | 4.70 |
| Net Fibre Usage (million m3) | 13.00 |
| Actual Net Earnings/m3 | 0.36 |
| Difference Between Required & Actual/m3 | (11.47) |

*Data Source: Price Waterhouse Report "The Forest Industry in British Columbia 1989"*

## ATTACHMENT 3
## CALCULATION OF EXCESS COASTAL PULP PROFIT

| | 1987 - 1989 Average |
|---|---|
| Capital Employed ($ millions) | 1,696.30 |
| Estimated Required Return | 14% |
| Estimated Required Annual Net Earnings ($ millions) | 237.50 |
| Net Fibre Usage (million m3) | 14.20 |
| Required Net Earnings/m3 Required | 16.72 |
| Actual Net Earnings ($ millions) | 296.00 |
| Net Fibre Usage (million m3) | 14.20 |
| Actual Net Earnings/m3 | 20.80 |
| Difference Between Required & Actual/m3 | 4.08 |

*Data Source: Price Waterhouse Report "The Forest Industry in British Columbia 1989"*

## ATTACHMENT 4
## CALCULATION OF EXCESS COASTAL NEWSPRINT PROFIT (LOSS)

| | 1987 - 1989 Average |
|---|---|
| Capital Employed ($ millions) | 936.30 |
| Estimated Required Return | 14% |
| Estimated Required Annual Net Earnings ($ millions) | 131.10 |
| Net Fibre Usage (million m3) | 5.90 |
| Required Net Earnings/m3 Required | 22.22 |
| Actual Net Earnings ($ millions) | 121.00 |
| Net Fibre Usage (million m3) | 5.90 |
| Actual Net Earnings/m3 | 20.50 |
| Difference Between Required & Actual/m3 | (1.72) |

*Data Source: Price Waterhouse Report "The Forest Industry in British Columbia 1989"*

# TABLE 3.4.1
# SMALL BUSINESS FOREST ENTERPRISE PROGRAM SUMMARY RESULTS OF SAMPLE OF CATEGORY 1 SALES WITH 1990 BILLED VOLUME

| | | | ---Volume Weighted ($/m3)--- | | | |
|---|---|---|---|---|---|---|
| Region | # of Sales Licenses Sampled | Cruise Volume (m3) | Upset Rate | Bonus Rate | Total Rate | 1990 Volume Billed (m3) |
| Cariboo | 8 | 198,270 | $5.77 | $11.87 | $17.64 | 89,787 |
| Kamloops | 9 | 165,504 | 7.09 | 11.81 | 18.90 | 76,094 |
| Nelson | 7 | 89,282 | 9.82 | 8.78 | 18.60 | 79,543 |
| Prince George | 26 | 767,582 | 13.00 | 7.24 | 20.24 | 457,867 |
| Prince Rupert | 12 | 274,694 | 11.26 | 18.33 | 29.59 | 172,492 |
| Vancouver | 13 | 422,449 | 12.05 | 15.48 | 27.53 | 172,770 |
| | 75 | 1,917,781 | 11.13 | 11.59 | 22.72 | 1,048,553 |

*Sample Selection Basis: All sales with cruise volume in excess of 20,000 m3 in which at least partial volume was billed in 1990. Also where a district had no sales in excess of 20,000 m3, the largest sale in that district was selected. The sample accounted for 36% of the allowable annual cut for category 1 sales.*

*Data Source: MOF*

## SECTION VIII

## FINANCIAL CONSIDERATIONS

### 1. Uncaptured Value

As shown in Section VII, current stumpage rates do not appear to capture all of the value available from the forest resource base. To maximize the value of the forests, it is clear that stumpage rates must increase.

From a financial point of view, the simplest approach is to raise stumpage rates to support what is believed to be a realistic value estimate. However, such a step would likely have severe consequences for the viability of segments of the industry in view of the impact of this cost increase on projected returns on new investment. Indeed, one result might be to place downward pressure on labour rates in the forest industry if new investment were to be undertaken.

To be practical, any program to increase stumpage rates must be conducted in such a way and over a sufficient time frame to allow adaptation to and acceptance of the new operating environment by all industry participants.

Because this transformation involves one party, the Province, seeking to recover value previously enjoyed by other parties - shareholders, corporation and workers, resistance to such change can be expected. Therefore, mechanisms must be found to allow this change to occur in a way which is perceived to be fair by the majority of provincial residents. One mechanism for achieving this goal, separation of the regulation and administration of forests, was suggested previously. Another mechanism is to require increased stumpage rates to pay for future silviculture funding.

### 2. Silviculture Funding

The value estimates derived under the Current Stumpage Income Valuation approach assume the fiscal 1990 silviculture expenditure of $206 million is:

i) sufficient to sustain the allowable annual cut;

ii) funded entirely from the revenues of Forest Resources Inc.; and

iii) treated as an annual expense.

Treating annual silviculture expenditures as an expense is equivalent to considering them to be part of an inventory replacement charge. Ultimately, this is what it will become. However, if replenishing the forest is initially considered to be a capital investment which provides benefits with some pre-defined average life, the silviculture expenditures could be capitalized and amortized in the future. This would result in a dramatic reduction in the needed immediate increase in stumpage rates.

By capitalizing these expenditures, Forest Resources Inc. would be able to fund silviculture from borrowings supported by increases in future stumpage rates rather than from current cash flow.

Under this scenario, the total capital (total value estimate) as derived using the Leveraged Model, Section VII - 2.5, would be modified as follows:

$$\text{Total Capital} = \frac{\text{Cash Flow + Silviculture Expenditures}}{\text{Weighted Average Cost of Capital}}$$

where;

| | | | | |
|---|---|---|---|---|
| Cash Flow + Silviculture | = | Base Case | - | $359.2 million |
| | | High | - | $430.3 million |
| | | Low | - | $288.1 million |

Capitalizing these estimated annual cash flows by using the average weighted cost of capital of 11.44% previously determined under the leveraged model results in the following range of values:

| | Low | Base Case | High |
|---|---|---|---|
| **Total Value Estimate Range** | $2,240 | $2,862 | $3,483 |

Implicit in the above analysis is the assumption that the cash flow to service the debt required to fund annual silviculture expenditures "financed" by Forest Resources Inc. will be paid through increased stumpage rates.

# Local Employment Impacts of the Forest Industry

prepared for the

British Columbia Forest Resources Commission

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Ministry of Finance & Corporate Relations

February 1991

# Local Employment Impacts of the Forest Industry

## 1. Introduction

In recent years there has been growing attention in British Columbia paid to the trade-offs implicit in the withdrawal of lands from traditional commercial forest activities.

To address this issue objectively the Planning and Statistics Division of the Ministry of Finance and Corporate Relations has undertaken a number of studies. These studies have, as a common basis, the goal of giving policy-makers valid information and insights as to the dependence of the provincial economy on the forests, and the probable impacts on the economy of reductions in traditional forest activity.

The studies to date, and others currently underway, use the B.C. Input Output Model (BCIOM). This model, based on Statistics Canada's Interprovincial Model, is a very rich, detailed specification of the linkages between industries in British Columbia, and permits consistent analysis of the impacts of specified changes in the provincial economy (e.g., of a new investment project).

Despite the acknowledged power and usefulness of the BCIOM, it does have a number of weaknesses and limitations. These are discussed in some detail in those studies which use the model. Here, it is sufficient to point out that as a provincial model, it can say nothing about regional and local impacts.

This study has been undertaken to fill this gap. It describes a method for estimating local employment impacts and illustrates its use by determining the degree of forest-dependence in three selected B.C. communities: Williams Lake, Kitimat, and Castlegar.

## 2. Methodology

The most common approach used to estimate the local impacts of changes in exogenous economic activity is the Economic Base Method. This method is based on the assumption that the local economy is composed of two sectors: the basic sector which is driven by exports from the region and the nonbasic or service sector which provides goods and services within the region. Thinking in terms of employment, the base employment multiplier is defined as

$$M = \frac{\text{Basic Employment + Nonbasic Employment}}{\text{Basic Employment}}$$

In practice, M can be used to estimate the impacts on total employment if there is a change in basic employment. It is worth noting that the Economic Base Method is equivalent to a highly simplified Input Output Model. (The similarities and differences between the two methods are discussed in more detail in Section 5.)

For any given area under study there is the practical problem of deciding which employment is basic and which is nonbasic. A number of approaches have been suggested to facilitate this decision: these include detailed special-purpose surveys, judgement (common sense), and the location quotient method. The latter is a mechanical procedure which compares the proportions of workers in each sector with the proportions in some bench-mark economy. For example, if a local industry employs 10% more workers than the benchmark economy then those workers are assigned to the basic sector. The remaining workers are assumed to be fulfilling local needs. The bench-mark economy is normally assumed to be some larger economy such as the province or country.

In this study there is neither the time nor the resources to carry out a detailed on-site survey, though this would undoubtedly be the best way to make the basic/nonbasic assignment.

This study will use a combination of judgement and an adjusted location quotient procedure. We will assume that all employment in the primary industries (Agriculture, Fishing, Trapping, Forestry and Mining) is basic. This assumption may somewhat over-estimate the size of the basic sector to the extent that, for example, locally produced lumber is used in residential construction, or locally grown vegetables are marketed in the grocery stores.

Employment in Manufacturing may be basic or nonbasic. We assume that it is basic unless the type of manufacturing is such that it clearly serves the local community. Examples of this are newspaper publishers and bakeries.

Employment in the other sectors - Construction, Transportation & Storage, Communications & Other Utilities, Wholesale Trade, Retail Trade, Finance & Insurance, Real Estate, and the Services - is assumed to be primarily nonbasic, but these may be reclassified as basic in two ways.

In the first place, Accommodation and Food Services is considered to be essentially basic, driven by tourism (an "export" phenomenon). All accommodation and part of food services are classified as basic; the procedure for determining the food services split between basic and nonbasic is described in Appendix A.

Secondly, the Modified Location Quotient (MLQ) procedure is used for these remaining industries to identify any potential basic activity. In most cases, it is expected that this will confirm that these activities are rightly classified as nonbasic.

However, if the MLQ procedure shows that the local area has a relatively high proportion of workers in one of these industries, the next step is to try to find out why. It might be discovered for example that the local area has a military base adjacent to it, or a major rail yard, or a university or technical college. Each of these activities would result in basic employment because the activities serve a wider region than the local community.

The ultimate purpose of this study is to be able to characterize a community by a single number which will facilitate the analysis of possible exogenous changes in forest related activities.

One way to do this is to calculate the "Proportion of Employment Attributable to Forest-related Activity" (PEF). In principle, the PEF for a community is determined in three steps.

A. First allocate employment (or labour force) to the following three categories:

EF = Logging, Forestry & Wood Manufacturing including Pulp & Paper
EO = Other Basic Activities
ES = Nonbasic Activities

B. Calculate

$$k = \frac{ES}{EO + EF}$$

C. Then

$$PEF = \frac{(1 + k) \times EF}{EF + EO + ES}$$

Observe that $1 + k = 1 + ES/(EO + EF)$

$$= (EO + EF + ES)/(EO + EF)$$

$$= \text{Total/Basic} = M \text{ as defined previously}$$

Observe also that a simpler form for PEF is $EF/(EO + EF)$.

The **"multiplier"** that can be thought of as turning basic employment into total employment is **1 + k**. In words, the PEF consists of all forest-related employment plus an attributed share of the service sector employment.

Examples illustrating this procedure for specific B.C. communities can be found in Section 4.

## 3. Data Sources

There are a number of sources of data on which to base a study of specific B.C. communities. Unfortunately, none of them is entirely appropriate, so for the purposes of this study we have selected information from various sources and combined it to produce the level of detail needed.

In the summer of 1990, the Planning and Statistics Division undertook a project to estimate and project employment for the rural communities in the province. Briefly stated, this was done by starting with 1986 Census labour force data and then estimating labour force by industrial sector for subsequent years using sectoral growth rates from the B.C. Economic Accounts. These estimates were reconciled at the regional level to figures from the labour force survey. Further adjustments were made for known startups or closures, always ensuring that the regional totals were reconciled. (Strictly speaking, it was labour force that was modelled and not employment).

Although inexact, we believe that these estimates are the best possible starting point for the present analysis. They are consistent with other published provincial growth rates, and they can be estimated for virtually every community in the province.

Unfortunately, this information is only disaggregated into 9 sectors:

Agriculture
Other Primary
Manufacturing
Construction
Transportation, Communications & Utilities
Trade
Finance, Insurance & Real Estate
Services
Public Administration

For the purpose of this study it was necessary to split "employment" into 3 parts: Basic related to the forest, Basic not related to the forest, and nonbasic. The above 9 sectors need further disaggregation in order to make this split. In particular,

(i) Forestry and Logging must be broken out of Other Primary;

(ii) Manufacturing has to be examined much more closely, because, as will become clear, there are candidates for all three categories in this sector;

(iii) Accommodation and Food Services need to be split into Accommodation Services and Food Services. We will assume that all Accommodation Services are basic and belong in the category EO, and that some fraction of Food Services are also basic - the method for determining this fraction is explained in Appendix A. Note that these assumptions may understate EF if significant numbers of loggers and other forest industry workers make use of commercial accomodation and food services.

There are two other sources of labour force/employment data by small area which we have used to do the necessary disaggregations. These are 1986 Census data and 1990 Dun & Bradstreet data. The former is 5 years old, and the latter is not as reliable as Census data. Nevertheless, both are more disaggregated industrially than our initial 1990 estimates. Neither Census data nor Labour Force Survey results separate Accommodation Services from Food Services; for this purpose it was necessary to use Dun & Bradstreet.

Finally, the 1990 Manufacturer's Directory has been used to disaggregate the manufacturing employment. This has been done by considering each establishment in the Directory in turn, and then allocating it and its estimated employees to one of the 3 categories on the basis of common sense:

(i) into "Basic Wood Related" go Sawmills, Pulp Mills, Other Wood Industries, as well as firms which make equipment for logging or the wood industries (the latter would normally be considered as Indirect in Input Output terminology - here they are defined to be Basic because the activity is assumed to be entirely dependent on the export of forest products from the community);

(ii) into "Nonbasic" go such "manufacturing" entities as Bakeries and Newspaper publishers which nominally manufacture goods, but which in the context of a small community are more logically seen as services to the local population and therefore nonbasic;

(iii) into "Basic Non-wood Related" go all other manufacturing.

In the case of wood-processing mills, the B.C. Ministry of Forests provided us with confidential employment data for each mill in the communities being studied.

## 4. Results

### A. Williams Lake

This approach can best be illustrated by means of a detailed example. Williams Lake is a city in the Cariboo Region whose economy is dominated by the forest industry. There are five permanent sawmills at Williams Lake and a plywood plant.

Though the forest industry is the most important segment of the economy, the contributions of cattle ranching, mining and the tourist industry are also significant.

The following table shows the allocation of the Williams Lake labour force to the various sectors of the economy and classifies them as Basic Wood Related, Basic Non-wood Related or Nonbasic.

| | Basic Wood Related | Basic Non-wood Related | Non-Basic |
|---|---|---|---|
| Forest & related | 3,046 | | |
| Other primary & manuf. | | 947 | |
| Construction | | | 1,013 |
| Transp, comm & utilities | | | 1,017 |
| Trade | | | 2,418 |
| FIRE & other services | | 1,168 | 4,577 |
| TOTAL | 3,046 | 2,115 | 9,025 |

Using the methodology defined previously, the Proportion of Employment attributable to Forest-related Activity (PEF) can by calculated as follows:

EF = 3,046
EO = 2,115
ES = 9,025

$$k = \frac{ES}{EO + EF} = \frac{9025}{2115 + 3046} = 1.749$$

$$PEF = \frac{(1+k) \times EF}{EF + EO + ES} = \frac{2.749 \times 3046}{3046 + 2115 + 9025} = 0.590$$

In other words, 59% of the employment in Williams Lake is dependent on the forestry industry.

The multiplier associated with Williams Lake is 2.749.

## B. Other Communities

Using the same methodology, the PEF has also been calculated for the communities of Kitimat and Castlegar. Following is a summary of the results:

| | Direct | Induced | Total (PEF) |
|---|---|---|---|
| Williams Lake | 0.21 | 0.38 | 0.59 |
| Kitimat | 0.10 | 0.15 | 0.25 |
| Castlegar | 0.30 | 0.40 | 0.70 |

## 5. Discussion

The procedure developed for this study, and used to produce the results of the previous section, has much to recommend it. We believe that it makes the best use of available data sources relevant to the problem at hand, and will permit us to carry out similar studies for other communities of interest in British Columbia. Nevertheless, there are some points which should be addressed before commencing those studies.

### (a) Application of These Results

In order to use the information developed in this study it is necessary to assume that the ratio of the total employment in a community to the basic (externally driven) employment is a stable and natural "artifact" of the community, and that if economic conditions change, the ratio will be the thing that maintains itself - i.e. employment will change in such a way as to maintain the ratio at its initial stable value.

There are at least two ways that one could examine the validity of this assumption. One would be to focus on the changes that have actually taken place in a particular town as the result of the known startup or shutdown of some basic industry. A second way would be to study many different communities, to determine if their ratios of total to basic employment differ significantly and, if so, to try to understand the reasons why.

### (b) Comparison with Input Output

There is some overlap between the methods and results of this paper and those of an Input Output Model, but also some important distinctions.

From an Input Output perspective, "direct" activity is activity which makes a product or service required to satisfy final demand. Activities which support direct activities by meeting intermediate demands are called indirect activities. For example, a sawmill producing lumber for export is a direct activity whereas the logging activity which produces the logs for the sawmill to process is called "indirect".

In this study we are assuming that all primary products and most manufactured products are "exported" from the local area, either directly or after additional processing. In this context then there is really no local indirect activity. The only distinction is between basic and nonbasic: the former associated with products or services for non-residents and dependent entirely on external markets, and the latter providing services to the local community.

In Input Output studies there is a third type of activity known as "induced". This is defined as activities generated by the spending of household income by wage-earners. Major beneficiaries of these induced impacts are sectors like Retail Trade and Personal Services. In this study the non-basic activity is equivalent to the induced activity of Input Output studies.

### (c) The Boundary Problem

Another difficulty is the "boundary" problem. This is primarily a data problem: the different sources of data we have for any particular community do not necessarily use the same community boundaries, and the proportions of workers in different categories differ depending on the boundaries used.

### (d) Allocation of Business and Industrial Services

Some community services like Transportation, Storage, Wholesale Trade and Business Services really act in part at least as support for industrial activities. In this study these services have been allocated to the nonbasic sector ES which means that they are attributed to EF and EO in proportion to the basic employment in those categories. This is probably acceptable as a first approximation and in the absence of better information, but it would be more accurate to attribute the employment in these services to the basic industry which they support.

There are two ways in which this could be done One would be to have better information concerning the nature of these activities in the communities under study. For example, how much trucking in Williams Lake is for wood-related materials? At present we do not have this information. A second way of approaching this problem is to use the Input Output database to determine the extent to which various basic industries make use of these industrial services. This information could then be used to make sensible attributions of these services in multi-industry communities.

(e) A fundamental assumption associated with this approach is that each basic job supports the same number of nonbasic jobs. However, it is arguable that a high-paying basic job may support more local service activity than a low-paying basic job. One could take these differential effects into account by incorporating the wage levels associated with the various industries into the analysis.

(f) In the study of some communities it would be important to take into account the economic activities generated by government transfer payments in the form of unemployment insurance payments, welfare cheques, and pensions. Alternative forms of the latter from private pension plans and savings should also be considered. Self-sufficient retired people are a kind of basic "employment" in the context of this approach. This issue has been considered minor enough to be ignored in the communities studied for this report.

## 6. Recommendations for Further Study

1. **Continue with data development and allocation for the communities under study.** In this preliminary report, we have utilized a number of data sources, but further research would improve the quality of the data and the consequent accuracy of the results.

2. **Focus more closely on the way in which this information is likely to be used**, or on the decisions which may be made using it, in order **to ensure that the analysis is consistent with the purposes to which it's being put.**

3. **Carry out longitudinal studies of some selected communities in order to check empirically on the impacts of major direct changes.**

4. **Use this procedure on a larger number of British Columbia communities.** This could have a number of consequences: from the results side it would enable us to categorize the communities by their degree of forest-dependence; from a methodological point of view, it could reveal the influence of other variables on the nonbasic/basic employment ratio - variables such as size or proximity to a larger urban area.

5. **Extend this methodology to reveal alternatives which might exist for communities facing declines in traditional forest activity.** This could be done through longitudinal studies of communities which have successfully reduced their dependence on logging, or just by examining the characteristics of those communities which have logging activity but which appear to be less dependent on it.

# Appendix A

## 1. Modified Location Quotient

The location quotient is a measure of relative concentration or specialization. As such, this method can be used to determine whether an industry should be classified as basic or nonbasic. Workers that are in excess of the norm established by the provincial economy are assigned to the basic sector of the local economy; all others are assumed to be satisfying local demand.

Inherent in this method is the assumption that the province is neither a net exporter nor a net importer. In B.C., this certainly is not true. As a result, the Location Quotient method has been modified to take into account the effect of B.C. exports. Provincial employment levels were adjusted to eliminate employment resulting from production associated with exports before the location quotients were calculated.

In this study, all primary industry has been assigned to the basic sector. Cereal grains, for example, that are produced in a region are assumed to "exported" from the region for processing before reappearing on the shelves of the local grocery store.

Location quotients were used to assist in the allocation of employment in the non-primary and non-manufacturing sectors to the basic and nonbasic sectors. If the location quotient is not greater than one, then it is assumed that the particular industry services the needs of the local community only. If, however, the location quotient is greater than one, part of the employment may be allocated to the basic sector of the economy. If it is clear from other sources whether this extra employment should be in EF or EO then it is allocated to the appropriate sector - otherwise it is left in ES, resulting in a proportional allocation.

The use of the modified location quotient in the determination of local employment impacts will be described more fully in a subsequent study.

## 2. Accommodation and Food Services

Recent survey results published by the Ministry of Tourism show the average per diem expenditures of tourists on various tourism commodities. According to this source, $15.33 is spent on accommodation, $3.35 on groceries and beverages, and $13.47 on restaurants and entertainment. So, of the total amount spent on Accommodation and Food Services, $P1 = 0.48$ is for Accommodation Services and $P2 = 0.52$ for Food Services.

Dun & Bradstreet publishes employment data by community for both Accommodation and Food Services. These numbers are used to allocate employees (from 1990 data) to each of the two categories. Let E1 be the number of workers in Accommodation Services and E2 be the number of workers in Food Services.

Job to Output ratios may be calculated using data from the British Columbia Input Output Model. The Job/Output ratio is the number of person-years of employment required to produce $1 million worth of output in a particular industry. (In the input output model, "output" is a gross output concept equivalent to shipments or sales values.) The Job/Output ratios are $J1 = 23.793$ and $J2 = 32.152$ for Accommodation and Food Services respectively.

As stated before, all of E1 is basic and some fraction, f, of E2 is also basic. The steps leading to the calculation of f follow:

A. $E1 \div J1$ is the expenditure by tourists on Accommodation.

B. it follows that they must spend $(P2 \div P1) \times (E1 \div J1)$ on Food Services.

C. the number of workers that this much expenditure on Food Services should employ is $J2 \times (P2 \div P1) \times (E1 \div J1)$

D. but basic employment in Food Services is $f \times E2$, so

$$f = (J2 \div E2) \times (P2 \div P1) \times (E1 \div J1) \qquad 0 \le f \le 1$$

E. so Food Services is split as follows:
$f \times E2$ is basic
$(1-f) \times E2$ is nonbasic (serves the local community)

# The Provincial Economic Impacts of a Supply Reduction in the British Columbia Forest Sector

prepared for the

British Columbia Forest Resources Commission

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# THE PROVINCIAL ECONOMIC IMPACTS OF A SUPPLY REDUCTION IN THE BRITISH COLUMBIA FOREST SECTOR

## 1. INTRODUCTION

We were asked by the British Columbia Forest Resources Commission to estimate the economic impacts which might result from a decrease in the annual allowable cut which would reduce the supply of inputs to the forest industry.

How *should* one estimate the contributions of various sectors to the provincial economy? The simplest way is just to estimate on the basis of in-sector activity. In the case of the forest sector, they reveal 8.2% of Gross Domestic Product (GDP) and 7.6% of employment in 1984.

However, there are other ways to allocate shares of the provincial economy, to split up the provincial pie so to speak. One other such way is to take the view that the economy is driven by external demands - primarily exports, but also by capital investments of business and government, and by other government expenditures. This is the perspective conventionally taken in input-output analysis, and input-output models are designed to trace and calculate the contributions of all industries in satisfying a particular component of external demand, such as lumber exports.

As soon as this approach is adopted, it is important to recognize that not all of a sector's activity belongs to its contribution. This is a demand-driven allocation procedure, and its strictures must be consistently followed if the shares of each industry are to be compared. For example, it is quite appropriate to allocate to forestry all of the economic activity which leads to the export of wood products. However, it would not be consistent to attribute to forestry the wood consumed by residential construction activities. In the latter case, the demands are made by the construction industry, and forestry merely supplies some of the inputs.

A previous study[1] of the Planning and Statistics Division revealed that although the provincial forest sector itself accounted for 8.2% of GDP and 7.6% of employment in 1984, its total contribution to the province rose to 16.2% of GDP and 15.4% of employment when indirect and induced impacts in other sectors were included in the analysis. The results of the earlier study are discussed in more detail in Appendix A.

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[1] Sectoral Review of the British Columbia Economy, Ministry of Finance and Corporate Relations, Planning and Statistics Division, Quantitative Analysis Branch, October 1990.

The previous study was an overview of the British Columbia economy and did not focus on any particular industries. The purpose of this paper is to interpret the previous results from the perspective of the B.C. forest industry and, in particular, to examine the probable economic impacts of a hypothetical reduction in raw material supplies to the forest industry.

Part 2 of this paper discusses the additional assumptions which have been made to adapt a demand-driven analysis to a supply question, and presents the results which follow from those assumptions. Simply stated, we make the assumption that a reduction in log supply will lead to a comparable reduction in forest-related industrial activity. Furthermore, we assume that the reduction is uniform across the entire industry, and not localized with respect to a particular sector of the industry or to a particular region of the province. We have not addressed land use issues; for example, we do not consider the economic impacts which may occur in response to the reduction, such as increased tourism.

The British Columbia Input-Output Model (BCIOM) is entirely based on 1984 data, and the previous study as well as Part 2 of this paper present results which are for the year 1984. In effect, we have attempted to estimate what would have happened in 1984 if there had been a reduction in raw materials supplied to the B.C. forest sector with no compensating activity. An obvious question is just how representative are these results for years other than 1984, in particular for a more recent year like 1989. Part 3 describes a simple method for answering this question and presents the results.

It is important to recognize that this is not a cost-benefit analysis for alternative modes of forest management. Neither is it an evaluation of land use alternatives. Instead, the paper attempts to estimate the possible economic impacts of reductions in traditional forest-based activities based on certain simple but reasonable assumptions.

## 2. IMPACTS OF A SUPPLY REDUCTION IN 1984

It is impossible to predict with certainty what would happen if supplies of logs were reduced. Uncertainties include the extent to which logs would be imported, mill activities would decline, exports would be affected, substitute materials would be used, etc. In the face of these difficulties, we have made what seem to us to be simple, but reasonable, assumptions.

In characterizing our assumptions and the results which follow from them, we will focus on a hypothetical ten per cent reduction in raw materials. We are not advocating such a reduction nor in any way suggesting that it is under consideration. The choice of 10 per cent is purely for expository purposes.

There are four significant ways in which a 10% supply reduction will affect the forest sector, and through it the B.C. economy. The first follows directly from the previous study. It is assumed that all forest-based production for final demand and the indirect activities which support it will also decline by 10%. Consequently, this results in a decrease of 1.6% in GDP and 1.5% in employment.

The second assumption and result is concerned with investment in the forest sector. Investment is a significant category of demand in input-output analysis, and investments in construction and machinery and equipment have been allocated to the construction industries and the producers of machinery and equipment in the traditional analysis of the previous study. However, we will assume that a 10% supply reduction leading to 10% less activity in forest-based activities, would also lead to 10% less investment by the forest industries in British Columbia. This assumption results in 0.1% reduction in both GDP and employment in B.C. in 1984.

The third effect is concerned with the appropriate allocation of certain transportation and wholesale markups to the industries which produce the goods and services to which they apply. Assuming that a 10% reduction in supplies of raw materials leads to 10% less of both forest-related activity and production of finished goods, the transportation and wholesaling industries will be affected. Recognition of these impacts leads to a further reduction in B.C. of 0.4% in both GDP and employment.

The fourth and final effect arises because, as was pointed out in Part 1, some forest sector activity supports other industries. Even if we assume that these other industries carry on by importing more forest products, this forest-based production for intermediate demand and the activities which support it will be curtailed by the hypothetical 10% reduction in supplies. These additional impacts further reduce provincial GDP and employment by 0.1%.

These results are summarized in Table 1 and discussed in greater detail in Appendix B.

**TABLE 1**
**Impact of a 10 per cent reduction in forest-related supplies, 1984**
(per cent of total provincial activity)

| | GDP | Employment |
|---|---|---|
| Production for Final Demand | 1.6 | 1.5 |
| Forest Sector Investment | 0.1 | 0.1 |
| Transportation/Wholesale Activity | 0.4 | 0.4 |
| Production for Intermediate Demand | 0.1 | 0.1 |
| **Total** | **2.2** | **2.1** |

## 3. EXTENSION OF RESULTS TO 1989

The best way to estimate the impacts of a supply reduction in 1989 would be to have an input-output model for 1989. Unfortunately, Statistics Canada will not develop such a model for the province for several years at least. There are over 300,000 individual pieces of data in the BCIOM, and the collection, verification and processing of such an immense amount of data takes several years, even with computers.

Approximate update procedures have been used in other jurisdictions to provide more current impact analysis between the major surveys required for a new model. The Planning & Statistics Divison would like to develop an updated model using these procedures, but even that task could not be undertaken in the time available for this study.

We have therefore used 1989 information from the B.C. Economic Accounts, the Labour Force Survey and other sources to estimate the direction and probable magnitude of changes in the 1984 results.

Simply speaking, our procedure was as follows. We assumed that the growth in the forest sector's contribution to the economy rose at a similar rate to the growth of forest sector exports. Likewise, we assumed that activities attributed to other sectors (like construction) grew at equivalent rates to their driving demand components. The results were constrained by the requirement that GDP in the forest industries would equal their observed values for 1989. Indirect and induced effects were estimated by assuming that inter-industry linkages, after an adjustment for price effects, remained constant. Employment estimates were derived by using observed employment to GDP ratios for 1989.

The results of these calculations are displayed in Table 2 below.

**TABLE 2**
**Impact of a 10 per cent reduction in forest-related supplies, 1989**
(per cent of total provincial activity)

| | GDP | Employment |
|---|---|---|
| Production for Final Demand | 1.7 | 1.4 |
| Forest Sector Investment | 0.1 | 0.1 |
| Transportation/Wholesale Activity | 0.5 | 0.5 |
| Production for Intermediate Demand | 0.2 | 0.2 |
| **Total** | **2.5** | **2.2** |

Appendix C provides greater detail on the data used and the precise calculations.

## 4. SUMMARY

We have extended and applied our previous sectoral analysis to the question of possible supply reductions in the B.C. forest sector. We have assumed that the supply reduction would have impacts beyond those attributed to the final demand of the forest sector, and have included these impacts in our calculations.

Our best estimate of the economic impacts of a 10% supply reduction in the forest sector is a 2.2% reduction in GDP and a 2.1% reduction in employment. These impacts are for the year 1984.

The forest industries in B.C. follow significant cyclical patterns, and have shown relatively rapid growth since 1984. Their shares of sectoral GDP appear to have peaked in 1987 suggesting that the results for 1984 would have been larger if based on a more recent year.

We have presented some simple approximations which indicate that the calculated estimates would have been somewhat larger in 1989: 2.5% for GDP and 2.2% for employment.

There is no time frame implied in these estimates: they are a measure of the total cumulative impact of the reduction in the log supply, given the conditions which pertain in the BCIOM and based on the current shares of the forest industries in the B.C. economy. Neither do these estimates assess the contributions to the provincial economy which could result from alternate uses of the forest resources permitted by the decrease in logging.

## APPENDIX A: CONTRIBUTIONS OF THE FOREST SECTOR, 1984

This Appendix is a summary of the estimated economic contribution of the forest sector originally presented in an earlier study: A Sectoral Review of the British Columbia Economy - An Input-Output Approach (Ministry of Finance and Corporate Relations, Planning and Statistics Division, Quantitative Analysis Branch, October 1990).

This study used the British Columbia Input-Output Model (BCIOM). The present version of this model uses inter-industry data supplied by Statistics Canada for the year 1984. Assumptions and definitions relating to the BCIOM and the analysis are presented in Appendix D.

For the purposes of the following discussion, the forest sector is defined to consist of the following industries:

- extractive logging and forestry;
- wood mills (e.g. lumber,plywood, shakes and shingles); and
- pulp, paper and allied.

Table A.1 summarizes the contributions of the forest sector to the B.C. economy in 1984. Note that references to GDP figures are based on current, or "nominal" dollar terms as opposed to constant or "real" dollar terms.

**TABLE A.1**

**Contributions of the Forest Sector to the British Columbia Economy, 1984**

(per cent of total provincial activity)

| | I | II | III | IV | V |
|---|---|---|---|---|---|
| | | | Indirect & Induced | | |
| | Sector Activity | Final Demand | Own Sector | Other Sectors | Total Impact |
| GDP | 8.2% | 5.0% | 2.6% | 8.6% | 16.2% |
| Employment | 7.6% | 4.5% | 2.5% | 8.4% | 15.4% |

The first column of the table, Sector Activity, shows that the forest sector contributed 8.2 per cent of total provincial GDP[2] and 7.6 per cent of total provincial employment[3] for 1984. These figures are the conventional ones for presenting an industry's contribution to the economy. However, they do not reflect the "upstream" activity in industries that supply goods and services to the B.C. forest sector. Input-Output models can provide a different view of each industry's contribution to our economy by first allocating final expenditures on goods and services to producing industries, and then by estimating the corresponding amount of upstream activity in supporting industries. These results are shown in Columns II, III, IV and V.

Column II presents final demand estimates for the forest sector in 1984.[4] The interpretation here is that markets classified as "final" accounted for 5.0 per cent and 4.5 per cent of provincial GDP and employment levels respectively. In fact, almost all of this activity represents wood, paper and pulp exports.

The third and fourth columns in Table A.1 represent the portions of the forest sector's contribution to provincial employment and GDP attributed to indirect and induced impacts (see Appendix D for further definition of these terms).

Column III lists the indirect and induced demand impacts on B.C. employment and GDP occuring within the forest sector itself. Note that approximately one third (2.5 relative to 7.6) of the forest sector's jobs are represented in column III. These jobs would include:

- a majority of the extractive logging jobs engaged in supplying logs to the forest processing industries like the wood, paper and pulp mills; and
- jobs in the sawmills producing lumber and timber that are sold to the other wood industries.

Column IV in Table A.1 shows that the forest sector generates 8.4 per cent of provincial jobs outside the forest sector. "Other sector" indirect and induced employment would include:

- transportation service personnel hired to deliver logs, wood chips, machinery and so on to the mills;
- employment required to supply energy in order to operate machinery and equipment in the wood, pulp and paper mills; and

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[2] It should be noted that there is a minor difference between the estimates for 1984 provincial GDP as given in the B.C. Economic Accounts and the Input-Output database. For consistency we have used the latter calculations in this paper.

[3] Statistics Canada Labour Force Survey.

[4] Final demand includes total investment, government and export spending on goods and services. Business spending, except for investment, is termed intermediate demand.

- retail clerks hired as a result of forest workers spending their income.

Summing the Employment impact figures for columns II ("final demand": 4.5 per cent) and III ("own sector": 2.5 per cent) produces the result that 7.0 per cent of employment is contributed by the forest sector in the satisfaction of final demand for forest products.

It should be noted that this 7.0 per cent does not represent all of the employment in the forest sector. As has been stated, the forest sector accounts for 7.6 per cent of provincial employment (column I of Table A.1). The 0.6 per cent difference (7.6 less 7.0) represents activities in the forest sector counted as indirect effects of other sectors (for example, the construction industry demanding lumber).

We will attempt to clarify the distinction between the effects represented by this 0.6 per cent figure and those represented as "other sector" impacts in column IV. The 0.6 per cent represents employment in the forest sector attributed to supporting final demand activity in other sectors (most notably, construction). On the other hand, the 8.4 per cent in column IV represents employment in other sectors attributed to supporting final demand activity in the forest sector.

The distinction is therefore that the 8.4 per cent is counted towards the total impact of the forest sector on the provincial economy, while the 0.6 per cent is not.

Another important distinction is the difference between the "Sector Activity" figures in column I and the "Total Impact" numbers in column V.

Column V figures are the sum of columns II, III and IV. Column V represents the total impacts of the forest sector on provincial GDP and employment levels - 16.2 and 15.4 per cent respectively.

We can see that approximately 54.5 per cent of the total employment impact - 8.4 relative to 15.4 - derives from the indirect and induced employment effects which forest sector creates in other sectors. Comparing this with the fact that only 7.9 per cent (0.6 relative to 7.6) of forest sector employment is attributable to the demands of other sectors yields the conclusion that the forest sector is of greater relative importance to other sectors in the B.C. economy as a "driver" than those other sectors are to the forest sector.

# APPENDIX B: IMPACTS OF A SUPPLY REDUCTION - DETAILS, 1984

## B.1. INTRODUCTION

The objective of this paper has been to estimate the potential impacts on GDP and employment levels that would occur due to a ten per cent reduction in the log supply to the provincial forest sector. This appendix provides some details on the estimates presented in the body of the paper.

For the purposes of the following discussion, the forest sector is defined to consist of the following industries:

- extractive logging and forestry;
- wood mills (e.g. lumber, plywood, shakes and shingles); and
- pulp, paper and allied.

We will be assuming that a 10 per cent reduction in the log supply would affect the extractive logging sector directly - i.e. result in a 10 per cent decrease in extractive logging activity. With fewer logs, the pulp, paper and wood processing mills would also be affected. We will make the simple assumption that their output also falls by 10 per cent. This decreased output from the mills would indirectly affect other sectors of the economy which supply material inputs for the wood and paper processing industries (eg. machinery, energy, financial services, etc.). These sectors would, in turn, decrease their production in response to these reduced activity levels, and so on.

A consequence of this decreased economic activity in all sectors is a reduction in employment levels. There would therefore be less wage and salary money circulating in the economy. This would induce a further reduction in the demand for consumer goods and services as persons whose incomes were affected reduced their expenditures.

For the purpose of this analysis, it is assumed that a ten per cent reduction in the log supply will produce a proportionate (i.e. ten per cent) reduction in: the paper and wood manufacturing sectors; investment in the forest sector; forest sector related transportation and wholesale activity; and, the production of forest products meeting intermediate demand originating in non-forest areas. In addition, we have counted all associated spin-off effects.

We will use the results of an earlier work which presents GDP and employment impacts for all industry sectors within the B.C. economy. These impacts are estimated using the B.C. input-output model (BCIOM) and Statistics Canada data for 1984. Results specific to the forest sector have been presented in Appendix A.

The earlier study provided impacts of B.C.'s industries following a conventional breakdown of demand. These results were driven by the final demand for each industry's products.

These results showed that 8.4 per cent of forest sector activity (GDP contribution) supports other industries (such as construction) and is therefore counted in this more conventional approach as an "indirect impact" of those other industries. In the next section we will isolate those impacts that our assumptions suggest would be affected by a reduction in the log supply. Some of these impacts would have been assigned to other sectors in the more conventional approach employed by the previous study.

## B.2. THE IMPACTS OF REDUCING THE LOG SUPPLY, 1984

Table B.1 is reproduced here from the text of the paper. It shows the results of the impacts on GDP and employment for 1984 based on the foregoing assumptions. The totals suggest that a ten per cent reduction in the log supply in 1984 would bring about a 2.2 per cent drop in provincial GDP and a 2.1 per cent drop in B.C. employment.

**TABLE B.1**
**Impact of a 10 per cent reduction in forest-related activities, 1984**
(per cent of total provincial activity)

| | GDP | Employment |
|---|---|---|
| Production for Final Demand | 1.6% | 1.5% |
| Forest Sector Investment | 0.1% | 0.1% |
| Transportation/Wholesale Activity | 0.4% | 0.4% |
| Production for Intermediate Demand | 0.1% | 0.1% |
| **Total** | **2.2%** | **2.1%** |

The table has broken down the impacts into four components. These will be described in turn below.

### B.2.1 PRODUCTION FOR FINAL DEMAND

The results of the earlier study show that, in 1984, the forest sector's total impact on provincial GDP and employment was 16.2 per cent and 15.4 per cent respectively (see Appendix A).

Logs are a necessary component of the production function for the paper and wood manufacturing sectors. Given the assumption that domestic processing for final demand markets falls by 10 per cent the result will be a 1.6 per cent decline in GDP and a 1.5 per cent decline in employment.

### B.2.2 FOREST SECTOR INVESTMENT

Investment spending for new plant and equipment is a volatile component of the B.C. economy driven by many complex factors. The present study has used 1984 as the year by which the impacts of reduced investment are measured. Moreover, the assumption is made that over the long term forest investment would fall by 10 per cent if logging and forest sector processing activity drops by 10 per cent. We have therefore included the impacts of ten per cent of forest industry investment in 1984. (It could be argued that investment activities would in fact fall by more than 10 per cent in the short-term until capacity levels corresponding to available timber supply were reached.)

As Table B.1 shows, the result of this assumption regarding forest sector investment is that a ten per cent reduction in the log supply will produce a drop of 0.1 per cent in both employment and GDP levels in the province.

Note that there is a small amount of double counting as some of the impact of investment will be reflected in the fourth component (intermediate demand) below.

### B.2.3 TRANSPORTATION AND WHOLESALE ACTIVITY

The Input-Output model values transactions in producers' prices, not the cost to the purchaser. The difference between purchasers' and producers' prices consists of wholesale and retail mark-ups, transportation costs and sales taxes.

This means that the transportation and wholesale activities associated with the delivery of pulp, paper and wood products to their final market (predominately export demand) are counted as impacts on the transportation or wholesale trade sectors. This impact is estimated as having a total impact of about 4.0 per cent of both provincial GDP and employment. Thus, in the context of the present discussion, the impacts of a ten per cent reduction in the log supply are assumed to produce a ten per cent drop in the transportation and wholesaling activities associated with the final sale of forest sector products.

Given these assumptions, a ten per cent reduction in the log supply would produce a 0.4 per cent decrease in both B.C. employment and GDP.

## B.2.4 PRODUCTION FOR INTERMEDIATE DEMAND

Again, we have assumed that a ten per cent reduction in log supply will produce a drop of ten per cent in this area. Allowing for further indirect and induced effects - the "spin-off" effects - produces a decline of approximately 0.1 per cent in both GDP and employment.

## B.3. SUMMARY: 1984 IMPACTS

Given all the assumptions detailed in the preceding sections, we estimate that the potential impact of a ten per cent reduction in the log supply in 1984 would have produced a 2.2 per cent decline in B.C.'s GDP and a 2.1 per cent drop in the level of provincial employment.

There is no time frame implied in these estimates: they are a measure of the total cumulative impact of the reduction in the log supply, given the conditions which pertain in the BCIOM. Neither do these estimates assess the contributions to the provincial economy which could result from alternate uses of the forest resources permitted by the decrease in logging.

By necessity, the assumptions employed in arriving at these estimates have been simplistic for such a complex issue. Nonetheless, we believe that they represent a reasonable first approximation of the impacts being discussed. The critical analyst may of course choose to alter the operating assumptions and re-evaluate the results accordingly.

The employment estimates are based on industry averages. However, in response to a decline in production levels, we note that while some employees will be laid off, others will take wage cuts or work fewer hours. In the short-term, the employment impact is likely to be smaller than that estimated from the 10 per cent of related employment. Because of this, we believe that our employment results in Table B.1 may overestimate the actual impacts.

# APPENDIX C: 1989 SUPPLY REDUCTION IMPACTS - DETAILS

## C.1. INTRODUCTION

By far the best way to make estimates about economic impacts for any particular year is to have an input-output model valid for that year.

The correct way to build such a model is to collect a great deal of information from many surveys and ancillary sources. This information is then reconciled, cross-checked and adjusted to ensure that the tables are in balance. The Statistics Canada national and inter-provincial models have 595 commodities, 7 primary inputs, 136 final demand categories and 216 industries in three arrays for a total requirement of over 300,000 individual pieces of data. The provincial government does not have the kind of resources for such a massive effort.

A second possibility is to adjust the coefficients of an existing model to reflect the changed conditions of a subsequent year. This must be done in such a way that known production levels and other industry statistics are reproduced by the revised model. Though all linkages between industries for the new year may not be known (if they were, we would have all the necessary ingredients for a new model), we can make the assumption that the economic structure is relatively stable and consequently that changes in these relationships are minimal. Although less accurate than the first approach, the results would incorporate the major trends and, more critically, be available on a timely basis. The Planning and Statistics Division would like to undertake a project to update the BCIOM, but resource constraints have not allowed us to do this to date.

Under the present circumstances, the best we can do is to present some statistics about 1989 and make simple approximations as to how the changes might affect the 1984 results of Part 2. 1989 is the most recent year for which there is GDP data for the province.

There are many assumptions in the arguments which follow. One big assumption at the outset is that the major drivers and linkages that comprise the B.C. economy have not changed appreciably in the five years between 1984 and 1989. In reality, there have been many changes: in particular, price levels in the forest sector have risen faster than those in other sectors and these will change linkages between the forest sector and its supporting industries. Additionally, exports of forest products have grown at a faster rate than the provincial economy as a whole. Forest sector employment, in contrast, has not grown as rapidly as overall provincial employment. Our goal however is to estimate the direction and approximate size of the various changes, and to indicate how these changes would affect the results of this study.

## C.2. GDP IMPACTS FOR 1989

Recall Table 1, from Part 2 of this paper (page 3), which is reproduced here as Table C.1 There are 8 effects represented in this table, 4 GDP impacts and 4 employment impacts. We will first develop 1989 estimates for each of the GDP impacts and then extend these results to the employment impacts.

**TABLE C.1**
**Impact of a 10 per cent reduction in forest-related supplies, 1984**
(per cent of total provincial activity)

| | GDP | Employment |
|---|---|---|
| Production for Final Demand | 1.6% | 1.5% |
| Forest Sector Investment | 0.1% | 0.1% |
| Transportation/Wholesale Activity | 0.4% | 0.4% |
| Production for Intermediate Demand | 0.1% | 0.1% |
| **Total** | **2.2%** | **2.1%** |

Our goal is to produce another version of Table C.1 which will be appropriate for 1989. It will display a simple approximation of the results we would expect to get if we carried out precisely the same procedures with a 1989 input-output database.

It will be most convenient to present the arguments for the first and last effects together (i.e. production for final demand and production for intermediate demand), because they are related. We will then make separate arguments for changes in investment impacts and impacts of margins.

## C.2.1 PRODUCTION FOR FINAL AND INTERMEDIATE DEMANDS

We first present a table[5] which displays the magnitudes of the linkages between the Forest sector and the rest of the economy in 1984.

**TABLE C.2**
**Impacts of the Forest Sector, 1984**
(per cent of total provincial GDP)

| | Forest sector | Other sectors | All sectors |
|---|---|---|---|
| Final Demand Impact | 4.97 | | 4.97 |
| Indirect Impact | 2.54 | 2.71 | 5.25 |
| Induced Impact | 0.05 | 5.91 | 5.96 |
| Total | 7.56 | 8.62 | 16.18 |
| Effects of Other Sectors | 0.69 | | |
| Total Forestry GDP | 8.25 | | |

This table is similar to a table in the Sectoral Review which deals with employment. The percentages shown are the shares of the entire 1984 B.C. economy. The 16.18 per cent is the total share of the B.C. economy attributed to the forest sector by the input-output procedure described previously. The 0.69 per cent is the activity in the forest sector which the same procedure has attributed to other sectors.

Observe that in 1984 the forest sector retained 91.6 per cent of its own activity (7.56/8.25) and had 8.4 per cent (0.69/8.25) of it re-allocated to other sectors. The larger share is mainly driven by exports of forest products whereas the smaller share is driven primarily by domestic residential construction. We can estimate these shares for 1989 by estimating the growth rates of the respective "drivers". Furthermore, we can determine Total Forestry GDP share for 1989. In this way, we can begin to construct the 1989 version of the above table from the bottom up so to speak.

The following information in Table C.3 comes from the B.C. Economic Accounts except for forest product exports. The export estimates come from the Economic and Statistical Review (1990) and the Financial and Economic Review (1985).

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[5] Table C.2 and many of the tables that follow carry more than one significant figure after the decimal point. This is done so that the results will be correct to one place of decimal after rounding.

**TABLE C.3**
**Selected Industry GDP and Expenditure Items (Millions of Current Dollars)**

| | 1984 | 1989 | Growth Factor |
|---|---|---|---|
| Total GDP at Factor Cost (GDPFF) | 45,422 | 67,565 | 1.49 |
| Forestry & Logging GDPF | 1,032 | 1,582 | 1.53 |
| Paper & Allied GDPF | 1,181 | 2,207 | 1.87 |
| Wood Products GDPF | 1,426 | 2,597 | 1.82 |
| Total Forest Sector GDPF | 3,639 | 6,386 | 1.75 |
| Residential Construction Expenditures | 2,347 | 4,911 | 2.09 |
| Forest Products, Exports | 5,937 | 9,963 | 1.68 |

Observe that the forest sector share of GDP has changed to 6386/67565 = 9.45 per cent in 1989. We will now determine the 1989 shares of forest sector activity driven by final demand for forest products (in-sector), and driven by demands from other sectors (out-of-sector) of this 9.45 per cent on the assumption that the in-sector share is proportional to exports of forest products and the out-of-sector share is proportional to residential construction expenditures.

in-sector: 91.6 x 1.68 = 154.31

out-of-sector: 8.4 x 2.09 = 17.49
171.80

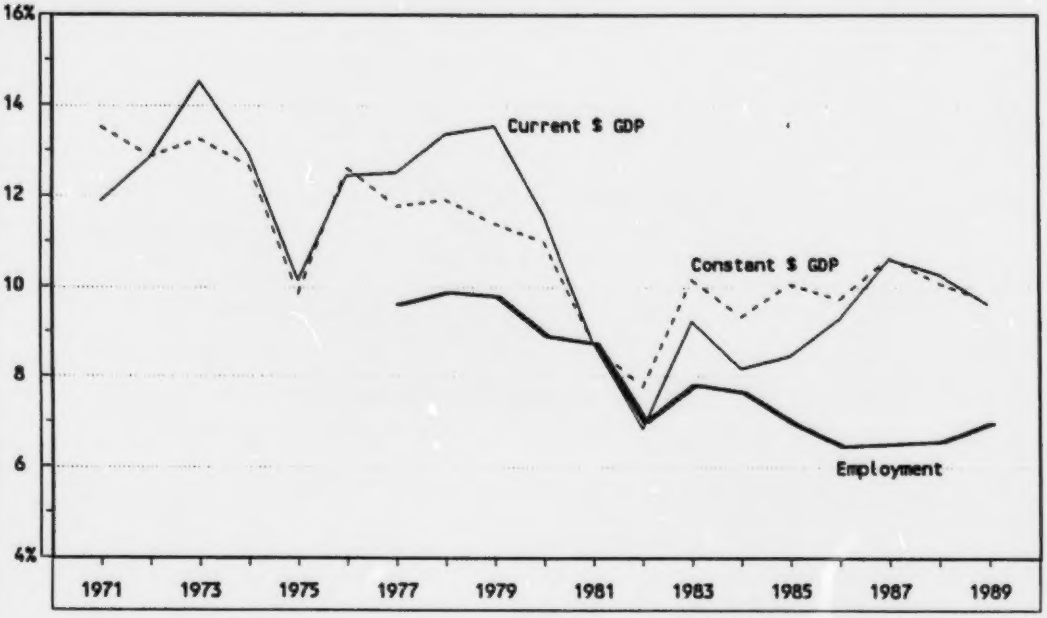
So the 1989 in-sector share is 154.31/171.80 = 89.8 per cent and the out-of-sector share is 10.2 per cent. Moreover these are the shares of the 1989 forest sector share of the economy of 9.45 per cent. Thus, the forest sector's out-of-sector contribution is 0.102 x 9.45 = 0.96 per cent, and its in-sector direct, indirect and induced contribution is 0.898 x 9.45 = 8.49 per cent.

We can now proceed to estimate the other values for 1989. In order to do this properly we will need to take price changes into account. This is because input-output multipliers assume there have been no relative price changes. However, there have been relative price changes in the economy. Refer to Figure 1 on the following page. Concentrating on the period between 1984 and 1989, it is evident that the forest sector has maintained a relatively constant share of real dollar GDP,

## FIGURE 1

### Forest Sector GDP as a per cent of Total GDP

### Forest Sector Employment as a per cent of Total Employment



Constant $ GDP based on Constant Dollar GDP at Factor Cost from the B.C. Economic Accounts

Current $ GDP based on Current Dollar GDP at Factor Cost from the B.C. Economic Accounts

Employment based on Labour Force Survey

but has substantially increased its share of current dollar GDP. This implies that prices of forest sector products have risen faster than the overall economy.

We can continue to apply the derived multipliers if we make appropriate use of the industry-specific implicit GDP price deflators published in the B.C. Economic Accounts. Those of particular interest to us in this study are reproduced in the table below.

**TABLE C.4**
**Implicit GDP Price Deflators, 1981=100**

| | 1984 | 1989 |
|---|---|---|
| Logging | 103.5 | 144.5 |
| Wood | 97.5 | 126.1 |
| Paper | 102.7 | 153.7 |
| Wood & Paper | 99.8 | 137.5 |
| Forest Sector | 100.8 | 139.1 |
| Economy | 115.5 | 140.3 |

In 1984 the derived ratio of in-sector indirect plus induced impacts to Final Demand impact was 2.59/4.97. To get the equivalent multiplier for 1989, we need to incorporate the relevant price deflators:

$$\frac{2.59}{4.97} \times \frac{144.5}{103.5} \times \frac{99.8}{137.5} = 0.528$$

The 1989 Final Demand Impact share is then calculated as 8.49/1.528 = 5.56 per cent and 1989 in-sector indirect and induced impacts are 2.93 per cent. To determine the indirect and induced impacts in other sectors, we assume that these are spread throughout the economy. As above, we must adjust the multipliers for relative price changes.

Indirect: $\frac{2.71}{4.97} \times \frac{140.3}{115.3} \times \frac{99.8}{137.5} = 0.481$

The out-of-sector impacts for 1989 are therefore 0.481 x 5.59% = 2.69% for Indirect and 0.514 x (8.49 + 2.69)% = 5.75% for Induced. We note here that a small portion of the induced impact is in-sector activity (5.96 = 0.05 in-sector + 5.91 out-of-sector from Table C.2). We assume that this proportion will be the same so that the in-sector induced effect is 0.05 per cent and the out-of-sector induced effect is 5.70 per cent. Therefore the in-sector indirect effect is 2.93 - 0.05 = 2.88 per cent.

We note that there are some implied assumptions in this methodology. First, there has been constant technology between 1984 and 1989, i.e. there are no increasing returns to scale, no capacity effects, no commodity substitution and GDP to output ratios have been constant between 1984 and 1989.

We can now construct the forest sector shares table for 1989.

**TABLE C.5**
**Impacts of the Forest Sector, 1989**
(per cent of total provincial GDP)

| | Forest sector | Other sectors | All sectors |
|---|---|---|---|
| Final Demand Impact | 5.56 | | 5.56 |
| Indirect Impact | 2.88 | 2.69 | 5.57 |
| Induced Impact | 0.05 | 5.70 | 5.75 |
| Total | 8.49 | 8.39 | 16.88 |
| Effects of Other Sectors | 0.96 | | |
| Total Forestry GDP | 9.45 | | |

The impact of a 10 per cent supply reduction on production for final demand is easily read from this table as 10 per cent of 16.88 per cent or approximately 1.7 per cent. The impact of the supply reduction on production for intermediate demand is related to the 0.96 per cent but should also include all activities in other sectors which support that activity (not displayed in the table). Since the supply reduction impact for this component was 0.148 per cent in 1984, and the magnitude of the driver has increased (from 0.69 per cent to 0.96 per cent), this component will rise to 0.21 per cent of the economy.

### C.2.2 IMPACTS OF MARGINS IN 1989

The margins referred to here are mainly wholesale and transportation margins applied to goods shipped to final users. Because these margins are tied to values of final shipments, and most of the relevant shipments in this case are exports, we make the assumption that the share of the economy associated with margins applied to forest products (estimated to be 4.15 per cent in 1984) will rise or fall with the volume of exports of forest products relative to the rest of the economy. This leads to the following calculation:

$$4.15 \times 1.68/1.49 = 4.68\%$$

In terms of our hypothetical 10 per cent supply reduction, the 0.42 per cent for reallocation of margins in 1984 rises to 0.47 per cent in 1989.

### C.2.3 GDP RESULTING FROM INVESTMENT IN 1989

Table C.6 below displays machinery and equipment and construction investment figures for the three major components of the forest group in 1984 and 1989.

**TABLE C.6**
**Impacts of Forest Sector Investment (Millions of Current Dollars)**

| | 1984 | | 1989 | |
|---|---|---|---|---|
| | Investment | Impact | Investment | Impact |
| Machinery & Equipment | | | | |
| Forestry | 51 | 15 | 80 | 24 |
| Wood Products | 161 | 48 | 511 | 147 |
| Paper Products | 217 | 68 | 1,393 | 430 |
| **Total Machinery & Equipment** | **430** | **132** | **1,984** | **600** |
| Construction | | | | |
| Forestry | 75 | 75 | 103 | 103 |
| Wood Products | 22 | 21 | 51 | 49 |
| Paper Products | 40 | 39 | 134 | 131 |
| **Total Construction** | **137** | **135** | **288** | **283** |
| **Total Investment** | **567** | **267** | **2,272** | **883** |

The investment figures come from unpublished data associated with the B.C. Economic Accounts and are expressed in current dollars. The impact column for 1984 was created in the course of doing the work reported in Section 2 of this paper.

Observe that 267/45422 = 0.006 which was rounded to 0.01 and became the 0.1 per cent investment impact reported in Table C.1.

The figures in the 4th column (1989 impacts) were calculated from the other columns by assuming that in each row the 1989 impacts were driven by the 1989 investments in exactly the same way as the 1984 investments had driven the 1984 impacts. By summing the figures in the fourth column we can estimate the total GDP impact of investment in the forest sector in 1989. We estimate the share as 883/67565 = 0.013 in 1989. The 10 per cent supply reduction effect is therefore 0.13 per cent for investment.

As can be seen from Table C.6, investment in 1989 was much higher than in 1984. There is some concern that neither of these years is "typical". However, it may be reasonable to infer that the investment impacts for these two years provide a range of the possible longer term investment responses to a reduction in log supply.

### C.2.4 SUMMARY OF RESULTS FOR 1989 GDP

The results associated with our hypothetical supply reduction, in terms of per cent of provincial Gross Domestic Product for 1989, are summarized in Table C.7 below.

**TABLE C.7**
**Impact of a 10 per cent reduction in forest-related supplies, 1989**
(per cent of 1989 GDP)

| Component | GDP |
|---|---|
| Production for Final Demand | 1.7% |
| Forest Sector Investment | 0.1% |
| Transportation/Wholesale Activity | 0.5% |
| Production for Intermediate Demand | 0.2% |
| **Total** | **2.5%** |

### C.3 EMPLOYMENT IMPACTS IN 1989

The procedure for estimating the various components of employment impacts is very similar to that for GDP as described in Section C.2. In fact, we can repeat each of the arguments of that Section, only slightly altered to translate the GDP impacts into employment impacts. This general alteration is described below.

For any of the components of the impact, let E(year) be the employment share in that year, G(year) be the GDP impact share in that year, and let JG(year,sector) be the job to GDP ratio for any particular sector in that year. Then, a reasonable estimate for E(89) is given by

$$E(89) = G(89) \times \frac{JG(89,PS)}{JG(89,BC)}$$

where PS stands for the Principal Sector in that component and BC stands for the entire provincial economy.

We can calculate each of the required JG's from the B.C. Economic Accounts and the Labour Force Survey.

**TABLE C.8**
**1989 Job/GDP ratios**
**(Employment per Million Dollars of GDP at Factor Cost)**

| Sector | JG89 |
|---|---|
| Logging | 15.7 |
| Logging & Wood | 18.4 |
| Paper & Wood | 15.0 |
| Households/Consumer | 20.7 |
| Forest Sector Investment | 21.7 |
| Entire Economy | 21.2 |

As an example, consider the Final Demand Impact of Production for Final Demand. Here, G(89) = 5.56. The Principal Sector is the combined sector of Wood Products and Paper & Allied. The appropriate JG values can be found in Table C.8. Then,

$$E(89) = 5.56 \times \frac{15.0}{21.2} = 3.93\%$$

The following table displays for each impact component the values of G(89), and the principal sector.

**TABLE C.9**
**GDP Impact Share (per cent) and Principal Sector, 1989**

| Component | G(89) | PS (principal sector) |
|---|---|---|
| Production for Final Demand | | |
| Final Demand | 5.56 | paper & wood |
| Indirect in-sector | 2.88 | logging |
| Indirect out of sector | 2.69 | entire economy |
| Induced | 5.75 | households/consumer |
| Production for Intermediate Demand | 2.10 | logging & wood |
| Margins | 4.68 | entire economy |
| Investment | 1.31 | forest sector investment |

Using the information in Table C.9 and the procedure described above, the total employment impact share for 1989 can be determined. The results are displayed in Table C.10 below.

**TABLE C.10**
**Impacts of the Forest Sector, 1989**
(per cent of provincial employment)

| | Estimated Employment Impact |
|---|---|
| Production for Final Demand | |
| Final Demand | 4.0% |
| Indirect - Forest Sector | 2.1% |
| Indirect - Other Sectors | 2.7% |
| Induced | 5.6% |
| **Total Production for Final Demand** | **14.4%** |

The other three employment impact components (production for intermediate demand, margins and investment) can be estimated in a similar manner. The employment impact of a 10 per cent supply reduction is calculated to be 0.2 per cent on production for intermediate demand, 0.5 per cent on transportation/wholesale margins and 0.1 per cent on forest sector investment. We are now able to apply our hypothetical 10 per cent supply reduction and display the resulting estimates for 1989 in Table C.11 below.

**TABLE C.11**
**Impact of a 10 per cent reduction in forest-related supplies, 1989**
(per cent of total provincial activity)

| | GDP | Employment |
|---|---|---|
| Production for Final Demand | 1.7% | 1.4% |
| Forest Sector Investment | 0.1% | 0.1% |
| Transportation/Wholesale Activity | 0.5% | 0.5% |
| Production for Intermediate Demand | 0.2% | 0.2% |
| **Total** | **2.5%** | **2.2%** |

# APPENDIX D: BACKGROUND, DEFINITIONS AND ASSUMPTIONS

## D.1 DEFINITIONS

Conventional GDP figures for each industry reflect what is called the "value-added" by that industry. Value-added is the value of an industry's output minus the value of its inputs from other industries. It is thus essentially comprised of wage income and corporate profits for the industry. Another way of looking at value-added is to think of it as the difference between a firm's gross sales and its purchases from other businesses.

Input output models such as the BCIOM, while conceptually identical to the GDP accounts, have additional details on the commodity purchases made by each industry. For the present discussion, it is sufficient to note that the BCIOM methodology enables estimation of the "multiplier effects" of:

- supporting industries that supply the intermediate goods and services to the driving industries (indirect effects);and
- employees spending their income on consumer goods and services (induced effects).

In the previous study on sectoral analysis (see Appendix A), GDP and employment impacts were estimated by sector. The total impact estimates of each sector included final demand, indirect and induced effects.

The **final demand** or initial impact of an industry is based on the amount of its products sold to final markets - i.e. export, government, and investment demand. In a discussion regarding the contributions of the forest sector it is important to note that residential construction is included as a component of final demand under the BCIOM.

The domestic production of all the goods and services that support the initial impact (final demand) constitute the **indirect effects** or intermediate demand of the sector whose final demand they support.

To cite a forest sector example, a mill producing pulp for export requires logs, energy, machinery, equipment, and financial services. The mill's demand for these goods and services constitutes an **intermediate demand**, or **indirect effect**, of forest sector activity. The demand for these inputs thus generates economic activity in other sectors of the economy. Moreover, each of these supporting production processes themselves require inputs, thereby creating additional indirect (intermediate) demand in the industries which support them, and so on. As a further example, we note that forest products supplied to the residential construction industry are counted as indirect effects of the construction industry.

The cumulative increase in demand along this production chain is what is referred to in this paper as the indirect or intermediate demand of the forest sector. There is yet another effect which must be considered. As all these industries increase their output to meet additional demand, they must pay for labour services. This income to the households does not remain idle, but is spent on goods and services. The GDP and employment consequences of meeting this change in consumer demand are referred to as the **induced impacts** of the forest sector.

In this paper, reference is made to the **total impact** of the forest sector. This refers to the total cumulative impact - final, indirect and induced demand effects - which the forest sector has on provincial levels of GDP and employment.

## D.2 ASSUMPTIONS RELATING TO THE SUPPLY REDUCTION ESTIMATE

Issues which could be considered include:

- the impact on relative price levels of both processed forest products and raw logs;
- the effects on future plant (building and machinery) upgrading by the forest sector (i.e. future investment);
- whether mills would find alternate (i.e. imported) sources of log supply;
- whether unprofitable mills would shut down entirely; and
- whether additional processing of wood products would occur.

The BCIOM cannot directly address many of these questions. However, given a suitable set of assumptions, the model can provide order-of-magnitude estimates of the impacts on the provincial economy of a ten percent reduction in the log supply in 1984.

The derivation of these estimates involved the standard assumptions employed in input output methodlogy. Input output assumptions of particular relevance to this discussion include:

- the use of standard input output linkages based on industry averages for the year 1984;
- no relative price changes and no commodity substitution; and

- no "safety-net" feature modelled in the analysis - i.e. the impacts of and on government programs such as Unemployment Insurance or Welfare have not been taken into account.

Assumptions are also made that a 10 percent decline in the log supply will result in a 10 percent decline in all of the following activities:

- production of wood and paper related goods that are sold to final markets and any "spin-off" effects;
- investment in the forest sector;
- moving paper and wood-related goods to final markets (e.g. transportation and wholesale activities); and
- production of forest products meeting intermediate demand (e.g. construction) and any "spin-off" impacts.

Other key assumptions employed in this analysis include:

- no reduction in government spending arising from lost revenue due to the decline in the business sector (loss of natural resource taxes and corporate taxes) or due to a decline in personal income (loss of personal income taxes);
- no decline in government activity within the forest sector (i.e. silviculture, fire-fighting, research, etc.); and
- no contributions to the provincial economy resulting from alternate uses of the forest resources "freed" by the reduction in conventional forest sector activity.

The following section is a brief description of input output methodology, describing the structure, valuation, assumptions and limitations.

## D.3. DESCRIPTION OF INPUT OUTPUT METHODOLOGY

### D.3.1 STRUCTURE

Input Output models were originally developed to trace the interactions between industries within an economy. In contrast to earlier models in which industries produced only one output, the B.C Input-Output model follows the more detailed variation adopted by Statistics Canada[6], in which industries produce one or more products.

The Input Output system is made up of three main tables:

- The industry technology table which determines what intermediate goods and services, including labour, are required for each industry to produce a given quantity of commodities.
- A market share table allocating demand for commodities to producing industries. This table determines what amounts of a particular commodity each industry produces. If each industry produced only one commodity, the structure would be simpler. However, many industries produce more than one commodity. For instance, sawmills produce mainly lumber and timber which is predominantly export-driven. As a by-product, sawmills also produce pulpwood chips which are used by the pulp and newsprint industry as an intermediate input. The market share table, in conjunction with the industry technology table, shows that the demand for pulp and newsprint will be supported by both sawmill activity (although pulpwood chips are a byproduct) as well as the primary logging industry which supplies logs for pulping.
- The final demand table, which provides commodity detail for all the components of final demand, corresponds in aggregate to the Expenditure Account of the Provincial Economic Accounts. As noted in the main text of this paper, this includes Investment (Residential and Non-Residential Construction, as well as Machinery and Equipment purchases by Business and Government), International and Interprovincial Exports, Change in Inventories, and Net Government Expenditures. Household expenditures are also included in the final demand table, although in the "closed" version of the input output model these are treated as an intermediate, supporting industry instead of as final demand.

In the input output system, transactions are detailed by type of good or service purchased, as labour costs, as taxes or as contributions to profit. The three tables are balanced, reflecting the usual accounting requirements that all expenses, labour costs and profits (i.e., inputs) total to gross sales (i.e., outputs). In addition, the tables present a balance of the supply and demand for each commodity (i.e., domestic production plus imports equals business demand plus final demand plus exports).

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[6] For a full description of concepts, definitions and model mathematics, see Statistics Canada publication 15-510, The Input-Output Structure of the Canadian Economy.

The database for the B.C. Input Output model uses 1984 data supplied by Statistics Canada from their full interprovincial input output model.

### D.3.2 VALUATION

Another aspect of the input output tables is that entries reflect producer or "factory gate" prices. To compare purchaser prices to producer prices, we observe that the cost to a purchaser, whether an industry or a component of final demand, comprises:

- the producer's price of a commodity,
- transportation charges,
- retail and wholesale trade margins if the commodity passes through one or more trading establishments, and
- commodity taxes (sales and excise).

Thus transportation, trade and tax margins are added to the producer or "factory gate" price to obtain the purchase price. In the input output system, commodity values are all recorded at producer prices. The margins are recorded as separate entries to allow for totalling to purchaser prices.

### D.3.3 INPUT OUTPUT ASSUMPTIONS AND LIMITATIONS

The input output model estimates the activity levels throughout the economy required to match a given level of final demand. As such, it is a demand-driven model and it produces demand-based multipliers. Without additional assumptions and considerations, which would be different for each sector, it cannot estimate the effect of supply constraints.

The input output model is a linear model of economic relationships. It assumes that there are no capacity constraints, no substitution effects and no economies of scale. The behavioral relationships within the model, despite considerable detail on the inputs consumed by industries, are, therefore, relatively simple.

The database is seven years old. However, because the technical relationships between industries tend to change slowly, the resulting industry multipliers are assumed to be relatively stable over time. Despite the various simplifications recognized in the input output approach, it is still widely viewed as the conventional way to estimate industry multipliers.

Another feature of the input output model is that it is static. The model traces the propagation of demand throughout the economy but it does not reflect the timing of the various spin-off effects.

The input output model estimates economic effects for the entire province. When economic effects within a community or a provincial region are needed, these provincial results may not be applicable or, at best, they would provide very rough estimates. To obtain local effects, specific information on the economic base for the community and the extent to which goods and services are supplied from outside that community should be incorporated.

Most industry analysts use multipliers from "closed" input output models, which trace the effect of consumer spending back to the sectors providing labour income. These models have been criticized for the validity of some of their assumptions. On the one hand, many households live off pensions, investment income, or government transfers such as welfare, which do not correlate strongly with industrial activity. "Closed" models, therefore, may tend to overstate the respending effect. On the other hand, investment and government spending are treated as independent activities but they should, in fact, be assumed to grow faster or slower in line with overall economic activity. The "closed" models ignore these effects. Because these effects tend to offset one another, "closed" input output models are considered to provide suitable estimates for most situations.

Components of final demand, particularly exports and investment, have strong cyclical patterns and this means that some of B.C.'s industries are also cyclical. For example, when forestry exports are at the peak of their cycle, the forestry sector and its upstream effects will make a higher contribution to GDP. The same could be said for mining exports and the construction industry. Results should be interpreted accordingly.